metals review

the news digest magazine

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Volume XXVIII-No. 4 April, 1955

HOLDEN SALT BATHS FROM STOCK

F. O. B., New Haven, Connecticut, Detroit, Michigan, Los Angeles, California

LIQUID CARBURIZING BATHS AND CARBON REAGENTS—WATER SOLUBLE

	Case Depths	Operating Temperature Range	
Light Case 50	.001 - .005	1400 - 1650°F.	Carbon A
Light Case 200	.001 - .010	1400 - 1650°F.	Carbon D
Hard Case 250	.001 - .025	1400 - 1650°F.	Carbon E
Hard Case 400	.001 - .040	1450 - 1750°F.	
Hard Case 500	.001 - .075	1450 - 1750°F.	
Hard Case 600 for replenishment only		1450 - 1750°F.	

HOLDEN NEUTRAL SALT BATHS WITH ADDITIVES REQUIRE NO RECTIFICATION

DO THE FOLLOWING THINGS:

1. Increase electrode life. 2. Increase ceramic pot life. 3. Increase alloy pot life.

NEUTRAL SALT BATHS with ADDITIVES

Hardening 185-10	1000 - 1500°F.
Hardening 127-11	1300 - 1650°F.
Hardening 127-12	1300 - 1650°F.
Hard Brite AA-10	1450 - 2000°F.

High Speed Hardening Baths with Additives

High Speed Preheat 13-17-10	1200 - 1700°F.
High Speed 17-24AA-10	1750 - 2350°F.
High Speed 17-22AA-10	1700 - 2300°F.
Hy-Speed Case	950 - 1150°F.

NO METHYL CHLORIDE OR CARBON STICK REQUIRED WITH HOLDEN BATHS

TEMPERING BATHS:

Tempering 2	500 - 1100°F.
Tempering 310A, fused	325 - 1100°F.
Tempering 350 Pink	325 - 1100°F.

ANNEALING BATHS:

Anneal 975 1075 - 1650°F.

MARQUENCHING & AUSTEMPERING:

Marquench 296

Marquench Additive 356,—to clear up chlorides in austempering-martempering baths.

RECTIFIERS:

Rectifier A—for special descaling operations or added cleaning.

QUENCHING OILS:

Clear Quench Quench 500 Martoil Martoil K

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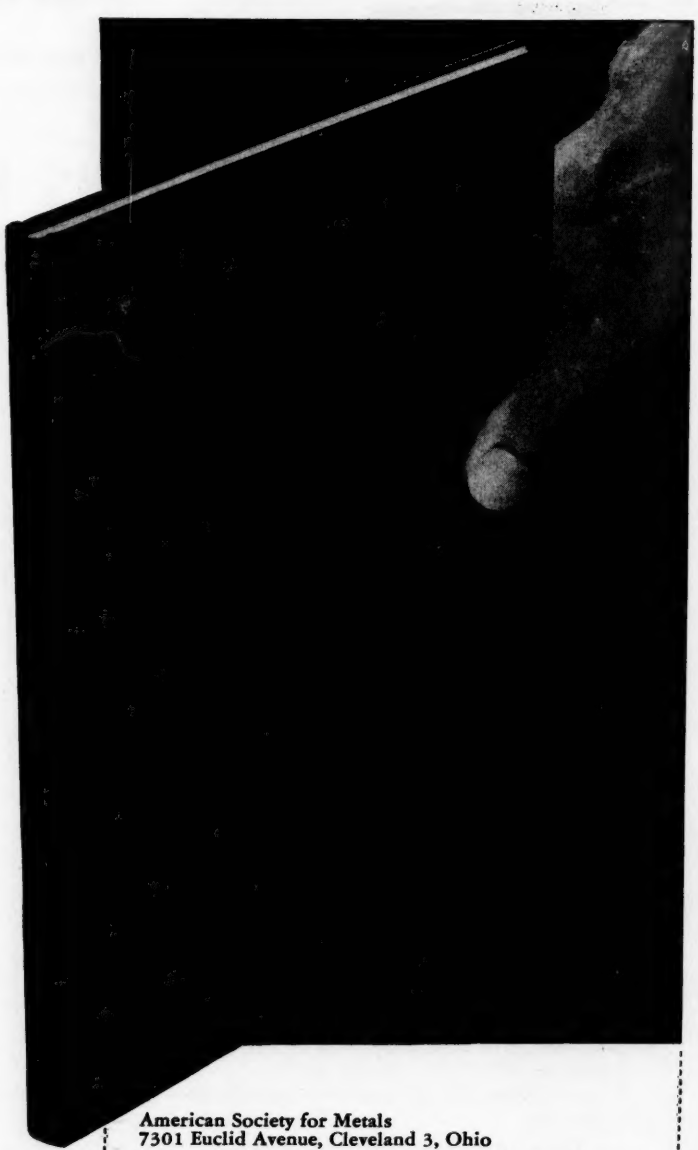

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Metals Review

VOLUME XXVIII, 4 April, 1955

THE NEWS DIGEST MAGAZINE

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A. S. M. of Tomorrow

Metal Research Laboratory

Progress is a word glibly used by politicians and historians—yet progress begins in the minds of men. . . . takes root only as the minds of men open to accept a challenging, different *idea*.

In the scope and boldness of the Point Four Program, as conceived in the now-famous A.S.M. of Tomorrow plan, there was a challenging, daring idea, an idea born of a real national need. . . a need perhaps not as yet recognized by some.

That such an institution will one day be created is unquestioned. The need is there, the purpose is there, the objectives apparent. Who will do it and how it will be achieved is another story. A.S.M. stands this moment on the threshold of greater things, and if, among its members and its officers, there may be found the spark of greatness. . . of acceptance of new ideas. . . of broadness of vision and the will to action, then A.S.M. will earn the gratitude of a whole nation of people who will live better, who will live safer, who will live more bountiful lives if this great A.S.M. Metal Research Laboratory becomes a reality. **C.S.**

THE NEXT new project for the American Society for Metals, in line with a policy of dynamic expansion, should be the establishment of a metal research laboratory. Properly organized and directed, it would fill an area now unoccupied and perform important functions now neglected, yet of great importance to America's metallurgical advance.

At present, laboratories in and for the metals industry may be roughly subdivided as follows:

1. Laboratories in the individual plant or in a central location of one corporation.

2. Governmental laboratories, such as those of the Bureau of Mines, National Bureau of Standards, Atomic Energy Commission, and at the Army Arsenals. Essentially these are the same as category No. 1 above.

3. Commercial testing laboratories, many of which are doing some development work. However, in metallurgy these are largely confined to inspection and representation.

4. University and endowed (or self-supporting) research institutes, whose work is principally an extension of that listed in categories No. 1 and 2 upon well-defined problems beyond the manpower or instrumentation available in the sponsor's own laboratory.

5. Laboratories for fundamental research, of which there are not very many—although there is a very good example in the University of Chicago's Institute for the Study of Metals.

Such a review, even though very brief, indicates one important field now all but completely neglected. Categories No. 1, 2, 3, and 4 work on *ad hoc* or practical problems of limited scope, designed to benefit a limited public.

Category No. 5 is working at the advanced frontiers of knowledge.

The gap between these two represents the field for the A.S.M. Metal Research Laboratory—namely, industrial problems in metals of widest generality, useful either to the whole metals refining industry, or to the whole heat treating industry, to the whole super-power industry, and so on. Since there is nothing like it in America now, one would have to go abroad to find parallels of laboratories studying the main problems of whole industries, such as the British Non-Ferrous Metals Research Association, the French Iron and Steel Research Institute, (IRSID), Centre Technique des Industries de la Fonderie, or the Swiss Watch Industry's Central Laboratory. In the United States we might have to go back as far as the 1920's and cite A.S.M.'s Past President Charles Herty's study of openhearth steelmaking processes at the Pittsburgh Station of the Bureau of Mines, financed by practically all the firms in the steel industry. In all these examples much work is done in the cooperating plants, thus avoiding installation of heavy equipment of mill type.

In brief, an American Society for Metals' research laboratory—with the objective of solving general problems concerning the use, and improvement and application of metals in American industry—would not be competing with existing effort, but would in fact fill a great gap in American metallurgical research.

When such an A.S.M. Metal Research Laboratory becomes a working organization it would naturally attract the type of problems it is equipped to handle. Undoubtedly it would be called upon, not only to serve the metals industry, but in case of emergency, may well serve the nation.

While the scale of activities in the A.S.M. Metal Research Laboratory would largely depend on the number of research programs devised by the laboratory director, it could also receive direct support from the American Society for Metals Foundation for Education and Research, and from the American Society for Metals itself.

Roberts and Young Guests in Montreal

At the President's Night Meeting Held Recently by the Montreal Chapter, National President George A. Roberts Presented a Talk Entitled "New Developments in Toolsteels". He is shown above, left, with J. P. MacEwan, Montreal chairman (center), and G. M. Young, national trustee and past Montreal Chapter chairman. (Reported by R. Sherwin for Montreal Chapter)

Western Metal Congress and Exposition

Scenes from the Pan-Pacific Auditorium

Success of the Ninth Western Metal Exposition, which was held Mar. 29 to Apr. 1 in the Pan-Pacific Auditorium, Los Angeles, was attested by its attendance and the large number of sales made by exhibitors.

Officially clocked attendance for the five-day show totalled 53,639. Exhibitors report that they not only sold from the floor, but acquired many prospective customers.

The heavily attended Exposition, as well as the Congress, will be restaged in Los Angeles from Mar. 25 through Mar. 29, 1957, Pan-Pacific Auditorium. The large exposition structure, with specially erected pavilions, will afford an expanded area of 175,000 sq. ft. of exhibit space. Dates in the month of March 1959 and 1961 have also been reserved.

Sessions at the Congress, held concurrently with the Exposition at the Ambassador Hotel, were better attended than ever before. Meeting rooms frequently were filled to capacity. The technical programs, which were attuned to metal production in the western states, received a wide response.

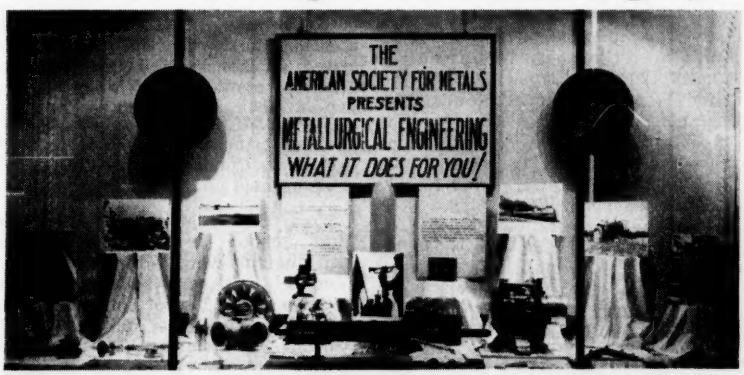
The American Society for Metals, American Welding Society, Society for Nondestructive Testing, Industrial Heating Equipment Association and the Los Angeles Chapter of the American Foundrymen's Society and 23 other technical societies cooperated in holding both the Exposition and the Congress.

Experiences in the exposition booths proved that the audience was in a buying frame of mind, seriously intent on investigating items and methods displayed. Attendance was distributed evenly, affording show goers with ample opportunity to acquire the information they needed for application in their work.

Importance of the metal developments in both Congress and Exposition was stressed by daily newspapers, technical magazines and television and radio programs.

The 1957 presentation of the long-established Congress and Exposition will be more educational and informative than any yet held on the Pacific Coast. Already, many requests for exhibit space in the 1957 show have been made. Further requests for space are reported being mailed, even at this early date, to A.S.M. headquarters in Cleveland.

Panel Hears Report on A.S.M. Display



An A.S.M. Display, Prepared by Members of the Canton-Massillon Chapter, Was Featured in a Canton Department Store During National Engineers' Week

The **Canton - Massillon Chapter** heard a panel of six metallurgists discuss "High-Temperature Alloys as Applied to Gas Turbines" recently. V. W. Whitmer, Republic Steel Corp., acted as moderator while the panel discussed questions which had been submitted by postcard prior to the meeting by the members of the Chapter. Panel members were: F. Welchner, Canton Drop Forging & Manufacturing Co., A. W. F. Green, Allison Division of General Motors Corp., C. Evans, Universal Cyclops Steel Co., F. Kroft, Haynes Stellite Co., H. Fernald, Curtiss Wright Co., and L. W. Ollila of Wyman Gordon Forge Co. Questions from the floor were also discussed by the panel.

At this meeting, a committee of Chapter members who had prepared a display which was placed in a window of the Stern and Mann Co., a downtown Canton department store, during National Engineers' Week in February, reported on its activities. The window space was made available through the cooperative effort of the Chapter with the engineering societies in the Canton-Massillon area organized by the Canton Regional Society of Professional Engineers. The committee sought the advice of Walter Morrison, A.S.M. director of public relations, and carried out his suggestions in the window display.

The seven top-volume consumers of metal products were illustrated by means of photographs and each photo was tied to specific examples of products used. A metallographic microscope was displayed with enlargements of typical steel microstructures to illustrate one tool used by the metallurgical engineer. A.S.M. publications were displayed, with copy describing the importance of the Society to the metallurgical engineer attached. Members of the display committee were A. J. Gusky, Republic Steel Corp., L. J. Best, Ford Motor Co., and W. E. Littmann, Timken Roller Bearing Co.—**Reported by W. E. Littmann for Canton-Massillon.**

Gives Talk on Gas Turbine Materials

At a Meeting of the Boston Chapter Were, From Left: W. L. Badger, Technical Chairman; N. J. Grant, Who Spoke on "Evaluation and Selection of Gas Turbine Materials"; Albert Navez, Coffee Speaker; and W. H. McCarty, Jr., a Member of the Executive Committee of the Boston Chapter

Speaker: Nicholas J. Grant

Massachusetts Institute of Technology

A lecture on the "Evaluation and Selection of Gas Turbine Materials" was presented by Nicholas J. Grant, department of metallurgy, Massachusetts Institute of Technology, at a meeting of the **Boston Chapter.** Dr. Grant discussed the interpretation of long-term tests to determine properties of materials intended for high-temperature service, and presented typical examples of instabilities which limit the usefulness of certain alloys.

Pointing out that a service life of 100,000 hr. is expected for gas turbine installations, Dr. Grant emphasized the need for reliable long-term data on behavior of alloys at high temperature. Some of the information must be obtained by extrapolation or calculation because of the extended periods involved. He illustrated plots aimed to establish the creep rate, rupture life and total elongation of alloys as a function of stress, temperature and time.

Prediction of behavior by conventional extrapolation of short-time curves is frequently impracticable due to metallurgical instabilities developed by materials in prolonged exposure. This was demonstrated by log-log plots of stress versus rupture life which showed sudden changes in slope following intervals of stability. These inflections correspond to various metallurgical changes such as overaging, selective oxidation, carbide precipitation, recrystallization or grain growth, and frequently indicate a change from transgranular to intercrystalline type of fracture. The significant role often played by oxidation in altering the slope was illustrated by graphs showing a uniform stress-rupture rate for materials protected by aluminum paint or hydrogen. Although metallurgical changes influence the accuracy of long-term predictions, it was shown that some extrapolation of plots may be permitted with proper selection of parameters.

Concerning consistency of high-temperature properties among successive heats of alloys, Dr. Grant mentioned that appreciable deterioration may develop with indiscriminate changes in melting or ingot practice.

In a discussion of compositions for gas turbine service, Dr. Grant indicated a safe working stress of 15,000 psi. for ferritic alloys to attain a useful life of 100,000 hr. with an operating temperature limit of 1100° F. At this stress level a temperature limit of 1300 to 1400° F. was indicated for lean austenitic alloys, and a temperature of 1500° F. for cobalt-base superalloys.

A practical operating difficulty with turbines employing crude oils containing high vanadium in the oil ash is an accelerated oxidation of blades by vanadium pentoxide. This limits operation to an inlet temperature of 1200° F. compared to 1350 to 1400° F. for vanadium-free oils. An instance of complete conversion of 16-25-6 blades to oxide was mentioned. Treatment of fuels with lime or magnesia, and use of metallic or ceramic coatings on blades have proved only partially effective in mitigating this action.—**Reported by M. B. Graham for Boston Chapter.**

Peoria Told How Forging Affects Metal Properties

Speaker: E. O. Dixon

Ladish Co.

E. O. Dixon, vice-president in charge of research and metallurgy, Ladish Co., discussed "How Forging Acts to Enhance Metal Properties" at a meeting of the **Peoria Chapter.**

Mr. Dixon emphasized that ductility and toughness of ingot metal is improved in all directions by plastic work and that this improvement is greatest in the direction of most deformation. This anisotropic nature is not extended to static strength properties. The importance of ductility, particularly in the transverse direction, was stressed.

Mr. Dixon cited numerous data indicating that when forging is done in closed dies, transverse ductility values are still further increased to bring them closer to longitudinal values. Increase in transverse ductility as thus accomplished is accompanied by small but consistent increases in density as determined by accurate laboratory determinations. Intense peak pressures developed by high-energy impact on metal under restraint in die closures was ascribed as the principal cause of these improvements.

New counterblow double acting hammers were described and evaluated. The larger capacity available in this design makes possible much larger sizes of closed die forgings, a more complete conservation of momentum for useful forging effort is achieved, with less dissipation of energy to surrounding soil, and with correspondingly higher forging forces. —**Reported by J. G. Frantzreb for Peoria Chapter.**

Compliments

To KENT R. VAN HORN, director of research for Aluminum Co. of America, on his election as an honorary life member of the Society for Nondestructive Testing. The award was made to Dr. Van Horn for his "pioneering work in the techniques and applications of nondestructive testing in industry".

To HOWARD BIER, Union Carbon & Carbide Corp., who has been designated an honorary member of the Institute of Welding of Spain.

To A.S.M. Secretary W. H. EISENMAN, on being elected president of the American Connection Institute at a meeting held in Las Vegas recently.

From SISTER M. THEOLA, Aquinas High School, La Crosse, Wis., who sent the following letter: It was indeed a great surprise and a great delight when I was informed that Tom Weidenkopf, a student at our school, was awarded first national prize in Region VI (Science Achievement Award). Tom himself was surprised and thoroughly delighted. In fact, all were, parents, students and teachers. This student is already planning another project for the coming year. . . The plaque for the school will certainly be a nice addition to our trophy case. . . .

The students and I want to thank you most sincerely. We feel this event will further stimulate and increase the interest of the students in the various fields of scientific experimentation.

OBITUARIES

HARRY B. LILLEY, a 30-year employee of the Timken Roller Bearing Co. and district manager of the steel sales division in the company's Detroit office, died in Detroit late in March.

A graduate of Carnegie Institute of Technology, Mr. Lilley started with Timken in 1925. He was a member of the Detroit Chapter.

♦ ♦ ♦

VLADIMIR A. GRODSKY, an A.S.M. member since 1930, died in Florida in January. Mr. Grodsky, who was born in Russia, came to the United States in 1915 and became a citizen in 1920. From 1928 he was associated with the National Bureau of Standards, transferring to the Naval Gun Factory in 1934, where he remained until his retirement in 1950.

♦ ♦ ♦

FINN JONASSEN, technical director of several of the National Academy of Sciences-National Research Council committees advisory to the ship structure committee, died in February in Washington, D. C.

Dr. Jonassen was born in Norway in 1907 and came to the United States in 1919. He graduated from the University of California in 1937 as a mechanical engineer, and received a Ph.D degree from the same university in 1941.

In 1942, Dr. Jonassen was in charge of war training courses of engineering sponsored by the University of California and in 1943 was drawn into war-time welding research projects, working on brittle fracture of hull plating of ships, a project which he continued after the war and up until the time of his death.

♦ ♦ ♦

HAROLD W. BROWALL, sales metallurgist, Inland Steel Co., died early in March in Detroit, where he was on a business trip. Mr. Browall, 54, was born in Pittsburgh and studied metallurgical engineering at Carnegie Institute of Technology and Pennsylvania State University. He had been a metallurgist for U. S. Steel Corp. and Dodge Motor Co. prior to his association with Inland Steel.

Ladies See Steelmaking Movie at Birmingham

At the first annual Ladies Night of the **Birmingham Chapter**, 20 couples met at the Homewood Elks Club for dinner and to see a film entitled "Steel—Man's Servant", a non-technical dramatization of steelmaking in color. Produced by professional Hollywood technicians for the United States Steel Corp., the movie showed the production steps from the time the raw ore leaves the mines until the finished product leaves the mills.—**Reported by J. B. Templeton for Birmingham Chapter.**

Precision Casting Method Outlined

At a Meeting Held in Montreal, F. S. Brewster, Harry W. Dietert Co., Presented a Talk on "Precision Castings". Shown are, from left: Alf Lewis, Chapter past-chairman; Mr. Brewster; and Claude Bourassa, chairman of the Eastern Canada Chapter of the American Foundrymen's Society

Speaker: F. S. Brewster
Harry W. Dietert Co.

Frank S. Brewster, vice-president and general manager, Harry W. Dietert Co., addressed a meeting of the **Montreal Chapter** on the subject of "Precision Casting by the 'D' Process". He highlighted the intermediate position held by this type of casting and the wide range of applications possible. The intermediate position is that between sand casting with its wide tolerances, rough finish and lack of eye-appeal, and investment casting, with its dimensional accuracy, smooth surface and natural "good looks". The range of application varies from high production long run parts, for which it is most suitable, to small quantity batch.

Stress was laid on the dimensional accuracy obtainable with this process. The smooth backing of a blown shell lends itself to accurate matching when shells are clamped together for casting.

Mr. Brewster drew attention to the simple nature of the sand-oil binder mix and the controlled properties available by adjusting the mix. The mix is such that no gassing problems are encountered during casting.—**Reported by R. Sherwin for Montreal.**

At ASM-ASTE Joint Meeting in St. Louis

James W. Dopp, LaPointe Machine Tool Co., Spoke on "Broaching—Modern Developments" at a Joint Meeting of the St. Louis Chapter and the St. Louis Section of the American Society of Tool Engineers. Present at the meeting were, first row, from left: Irwin Schumaier, chairman, A.S.T.E.; Mr. Dopp; and George Fisher, chairman, A. S. M. In the second row, from left, are: R. D. Bardes, secretary, A. S. M.; Julius Turk, vice-chairman, A. S. M.; Harold Zimmerman, vice-chairman, A. S. T. E.; and Clarence Hall, second vice-chairman, A.S.T.E. (Reported by W. Holtgrieve)

A.S.M. Members' Names Added to Quarter Century Club Roster

The following A.S.M. members have been awarded honorary certificates commemorating 25 years consecutive membership in the Society:

Boston Chapter—Paul D. Ffield, Edwin I. Hope, Peter R. Kosting, Leo G. Madard, John T. Norton, Jacob B. Savits.

British Columbia—Frank R. Barnsley.

Buffalo Chapter — Alexander V. Saharoff, Brace-Mueller & Huntley, Inc.

Calumet Chapter—James W. Halley, Charles J. Hunter, H. Raymond McCoy, Edwin F. Mitchell.

Canton-Massillon Chapter—Martin Fleischmann.

Chicago Chapter—Nels Augustson, H. W. Browall, Clyde C. Crane, Irving A. Dickter, John T. Georgeson, Howard F. Graff, L. F. Lottier, Chester V. Nass, Peoples Gas Light & Coke Co., and the Surface Combustion Co. Inc.

Cincinnati Chapter—Kurt Siems.

Cleveland Chapter—W. A. Black, Charles W. Briggs, Edmund F. Burke, Harry D. Churchill, Walter H. Clark, Jos. B. Clough, E. F. Collins, C. P. Critzer, George D. Dolch, Jr., Glenn E. Shoemaker, Ralph R. West, George W. Yearley.

Columbus Chapter — Clarence H. Lorig, William A. Welcker, Jr.

Dayton Chapter — Frederic L. Chase.

Detroit Chapter—John H. Abbott, H. Einar Ardahl, F. D. Burnett, Robert Guthrie, William P. Lewis, Clarence A. Siebert, Hubert C. Smith, E. C. Wahl.

Eastern New York Chapter—John Q. Adams, Goodwin H. Howe.

Golden Gate Chapter — Geo. H. Thurston, G. M. Van Dewater.

Hartford Chapter — Austin L. Stowell.

Jacksonville Chapter—Don M. McCutcheon.

Lehigh Valley Chapter—Henry C. Bigge, Wilbur E. Harvey, A. R. Laubenstein.

Los Angeles Chapter—Donald S. Clark, Hubert C. Swett.

Mahoning Valley Chapter—Harold H. Johnson, A. D. Kent.

Michigan College of Mining & Technology—George L. Craig.

Montreal Chapter — Thomas V. Green, Gordon McMillin, G. H. Rennie, H. H. Richardson.

Muncie Chapter—Robert J. Peters.

New Haven Chapter — Carl A. Baden, Ludwig V. Kunkel, Floyd E. Raymond, Joseph Zak, S. O. & C. Co.

New York Chapter—Carleton E. Carrigan, L. E. Ekholm, Edward J. Guinee, D. J. Marsden, N. B. Pilling, Ernest Post, Otis Elevator Co.

Northwestern Pennsylvania—Lloyd G. Toye.

Ontario Chapter—J. H. MacBean, Dominion Foundries & Steel, Ltd., Wallace Barnes Co., Ltd.

Philadelphia Chapter—Arthur M. Gebert, Richard N. Hirsch, Lester R. Walker.

Phoenix Chapter — William B. Arness, N. F. Ward.

Pittsburgh Chapter — John Chumasero, Gunnard A. Eliason, Clinton Hart, Laurence C. Hicks, Arthur Hjortsberg, C. A. Liedholm, Alfred W. MacLaren, Dr. R. F. Miller, John J. B. Rutherford, George F. Sager, J. L. Young, Duquesne Light Co., National Tube Co.

Puget Sound Chapter—Harold E. Cleaves, L. T. Holt, Sidney K. Smith.

Rhode Island Chapter—Walter M. Saunders, Jr.

Rochester Chapter — George E. Burkhardt, Otto Martin, Carl F. Wattel, Davenport Machine Tool Co.

Rockford Chapter—Carl Muehlemeyer.

Rome Chapter—Leland E. Gibbs.

St. Louis Chapter—Raymond G. Kern.

Springfield Chapter—Weston Morrill, George R. Wilcox.

Texas Chapter—Donald Wilson.

Toledo Chapter—R. L. Adams, Sr.

Washington Chapter — Oscar T. Marzke.

West Michigan Chapter—Horace A. Deane, R. L. Stephenson.

Worcester Chapter—Johnson Steel & Wire Co. Inc.

York Chapter — Harry L. Hovis, York County Gas Co.

National Chapter—William G. Van Note.

International Chapter—L. Chapman, Percy B. Henshaw, John U. Vass, Tom W. Whiting.

Outlines Mechanical Behavior Of Metals at Southern Tier

Speaker: J. H. Hollomon

General Electric Co.

"Mechanical Behavior of Metals" was the subject of a talk given at a meeting of the **Southern Tier Chapter** by J. H. Hollomon, manager, metallurgical research department, General Electric Co.

Dr. Hollomon discussed the mechanical behavior of metals. He introduced the subject by pointing out that the theoretically predicted strength of metals is approximately 100 times their experimentally determined values. This discrepancy between theory and practice was explained by the fact that in practice metals are not perfect but contain imperfections called dislocations. These dislocations are necessary to the growth of crystals, a point amply illustrated in the motion picture shown. Dr. Hollomon also interpreted the current methods of strengthening metals in terms of their effect on the dislocations.—**Reported by T. F. Conmy for Southern Tier Chapter.**

Alberta Chapter Briefed on Nickel and Its End Products

Speaker: A. S. Tuttle

International Nickel Co. of Canada

A. S. Tuttle, International Nickel Co. of Canada Ltd., presented a talk on "Nickel and Its End Products" at a meeting held by the **Alberta Chapter.** Mr. Tuttle, with the assistance of the Chapter's projectionist, Ted Anderson, followed up his talk with two films on the mining and smelting of nickel by his company in Ontario.—**Reported by J. D. Zmurchyk for Alberta.**

Tennessee Student Awarded Scholarship

The University of Tennessee Awarded Its First A.S.M. Scholarship to Billy M. Hargis (Center), During a Recent Meeting of the Oak Ridge Chapter. E. E. Stansbury (Right), professor at the University, presented the award, while Peter Patriarca, Chapter chairman, offered congratulations to Bill, a metallurgy junior. (Reported by Anton deS. Brasunas for Oak Ridge Chapter)

Manufacture—Fabrication Of Magnesium Outlined

Speaker: John C. McDonald

Dow Chemical Co.

John C. McDonald, assistant technical director of the magnesium department, Dow Chemical Co., spoke before the **Mahoning Valley Chapter** on the "Manufacture and Fabrication of Magnesium Sheet and Extrusions".

Magnesium possesses a unique combination of properties which readily distinguish it from other metals. The best known property is, of course, its light weight (35% lighter than aluminum and 78% lighter than steel). Properties of this metal which cause difficulties during processing are its restrictive degree of workability due to the hexagonal crystal structure which requires hot working, and its high affinity for oxygen at elevated temperatures.

Magnesium is alloyed for strength and while these alloys are not as strong as those of aluminum, titanium or steel, rigidity is brought about by using thicker sections and better design, without sacrificing the weight advantage.

Magnesium offers greater resistance to buckling or compressive strength than either aluminum or steel on an equal weight basis, and also offers superior resilience.

All of the magnesium produced today comes from sea water, which is 0.13% by weight of this metal. Some rich brines in Michigan contain 10% by weight. At the present time, 40,000 tons of this light-weight metal are being produced in the U. S., the world's largest producer. By 1975, some 200,000 tons are expected to be produced. At one of Dow's plants, 10 in. × 40 in. × 60 in. slabs are hot rolled into 2 in. thick coils in a matter of a few minutes; after coiling and annealing, gage reduction is obtained by a series of reheat and reroll operations.

Forming of magnesium sheet is done hot and temperature must be controlled to maintain the proper hardness. Magnesium must be machined dry, especially if the chips are fine, due to the fire hazard.

The principal methods of joining are spot welding and arc welding by the Heli-arc method.

The resistance of magnesium to corrosion during normal use, such as atmospheric exposure, is quite high. However, this metal is highly susceptible to galvanic-type corrosion, such as the presence of dissimilar metal and salt water. This fault can be overcome by insulating between the two metals.

The military is still the largest user of fabricated and extruded parts of magnesium.—**Reported by John D. Anderson, Jr., for Mahoning Valley.**

Speaks on Gas Turbine Design Problems

R. B. Johnson, Aircraft Gas Turbine Division, General Electric Co., Gave a Talk on "Metallurgical Problems of Gas Turbines" at the Young Fellows' Night Meeting Held by the Chicago Chapter. Shown, from left, are: J. A. Kubik, Chapter chairman; C. Samans, vice-chairman; Mr. Johnson; L. Hjelm, Illinois Institute of Technology student who was awarded an A.S.M. Scholarship; Chairman A. Lukowitz, Illinois Institute Junior Chapter; and F. Kisslinger, associate professor at the Illinois Institute of Technology

Speaker: R. B. Johnson

General Electric Co.

R. B. Johnson, manager of the materials laboratory of the Aircraft Gas Turbine Division of General Electric Co., spoke on "Metallurgical Problems in the Design of Aircraft Gas Turbines" at the Young Fellows Night meeting of the **Chicago Chapter.** His talk was preceded by a short tour of the Chicago Museum of Science and Industry.

Material problems in the development of aircraft gas turbines, particularly those associated with the compressor and turbine, were discussed by Mr. Johnson.

SAP, sintered aluminum powder, is an important alloy, probably because it demonstrates an area for future work. This controlled metal and oxide material presents a very high level of properties at high temperature compared to aluminum alloys, but the idea that metal and oxide can be sintered, extruded and ultimately precision forged is very important and may be applicable to other base metals.

Titanium alloys are losing some popularity; in fact, this "middleweight champ" is coming out second best when compared to many ferritic alloys for extreme requirements, particularly in view of fabrication difficulties and price differential.

Ferritic alloys, which have undergone great development in recent years, show distinct advantages over titanium alloys. Although they must be protected from corrosion, usually this can be done with known processes such as high-temperature paints, aluminizing, etc.

Austenitic iron-base alloys have been given a shot of age hardening alloys, such as titanium and aluminum, to make them useful as high-strength materials to 1400° F. or more.

The nickel and cobalt-base alloys have been used extensively where very high temperature and strength are needed as well as in turbine buckets. Titanium and aluminum have been helpful in reducing strategic alloy content. The role of vacuum melting has not been completely evaluated, but it appears that it will have a pronounced effect on the development of new alloys of this particular base composition with very highly refractory alloy additions of higher percentage. Vacuum melting of alloys has improved their stress rupture, fatigue and hot working properties.

Beyond the use of vacuum melting, the future points towards the use of such materials as cermets, molybdenum and chromium. Cermets of the K162B-type have strength advantages over the nickel and cobalt-base alloys in current use. However, they do not have the same combination of good engineering properties the designer has learned to use. They have a basic problem of low ductility and notch sensitivity that require unusual design considerations. Molybdenum alloys, which are by far the most attractive for strength and over-all engineering properties, have the well-known disadvantage of high oxidizing rate at temperatures in excess of 800 to 1000° F. If molybdenum can be protected, it will present a significant advance in the physical factors now limiting the future development of gas turbines.

Larry Hjelm, a student of Illinois Institute of Technology, was presented an A.S.M. Foundation for Education and Research scholarship during the meeting.—**Reported by C. W. Saenger for Chicago.**

S has produced and makes available for showing before chapters and educational institutions, moving picture films pertaining to metals.

ASM-ASTM Hold Joint Meeting at Rome

Present at a Joint Meeting of the Rome Sections of A.S.M. and A.S.T.M. Were, From Left, Seated: Truman S. Fuller, A.S.T.M. Past President; Norman L. Mochel, A.S.T.M. President and Speaker of the Evening; and Max Howard, Chairman, Rome Chapter A.S.M. Standing, from left, are: Rudolf A. Schatzel, program chairman; Ernest Grider, vice-chairman, Rome Chapter A.S.M.; and R. J. Painter, executive secretary A.S.T.M.

Speaker: Norman L. Mochel

Westinghouse Electric Corp.

The first of a series of joint A.S.M.-A.S.T.M. sponsored meetings to be conducted throughout the nation was held by the **Rome Chapter** A.S.M. and the Western New York-Ontario District A.S.T.M.

Norman L. Mochel, president of the A.S.T.M., spoke on "Power and Materials, Now and in the Future—Metals and Materials Problems".

Mr. Mochel, manager of metallurgical engineering at Westinghouse Electric Corp., reviewed the progress of steam turbine systems over the past half century. The problems being created by the giant new installations as well as their correction were presented in a critical evaluation of the metals and other materials being used.

An analysis of marine power application and problems were described, as well as the future use of nuclear energy. Inasmuch as the nation's power sources are a vital part of our defense and economy, these items will be very important in the future, he explained.

Data on the electrical industry for the past 50 years demonstrated that the consumption of electricity was constantly increasing and labor costs were greater by many per cent, Mr. Mochel pointed out. Yet, the cost to the customer per kilowatt hour (less taxes) has decreased over the same period. This accomplishment is due in great part to the newer and larger steam turbines of higher efficiency.

R. J. Painter, A.S.T.M. executive secretary, spoke on "Cooperation in Materials Research and Standards". He emphasized the need for mutual cooperation of various industry and technical groups to develop the best standards. Industry broadly, individual companies, federal, state and municipal governments, as well as the military, benefit from this cooperative work more each year.—**Reported by J. M. Thompson for Rome.**

Roberts Guest at Hartford

George A. Roberts, A.S.M. national president and vice-president in charge of technology, Vanadium-Alloys Steel Co., presented a talk on "Toolsteel—New Developments and Applications" at the National Officers and Past Chairmen's Night held in **Hartford.**

Dr. Roberts pointed out the requirements for a wide variety of toolsteel applications and discussed wear resistance and toughness properties of toolsteels.—**Reported by G. W. Hunt for Hartford Chapter.**

Gives Details of Vacuum Techniques in Metallurgy

Speaker: A. M. Aksoy

Vacuum Metals Corp.

At a meeting held by the **Notre Dame Chapter,** A. M. Aksoy, chief metallurgist, Vacuum Metals Corp., presented a talk on "Vacuum Techniques in Metallurgy".

Dr. Aksoy gave a brief history of vacuum melting techniques, stating that they were used by the Germans prior to World War II. The major progress in this field has been due to rapid developments in the techniques of high vacuum. To date, furnaces used have had a small capacity; however, Vacuum Metals Corp. is presently building the largest installation in the United States.

High-vacuum techniques are used in metallurgy for the purification, plating, heat treating and vacuum melting of metals.

The speaker explained that melts made by the vacuum process have superior ductility, fatigue, impact and stress rupture properties to those made by conventional processes. Melts have very close chemical limits and a minimum of inclusions and stringers.—**Reported by R. C. Pocock for Notre Dame Chapter.**

IMPORTANT MEETINGS *for May*

May 1-5—Electrochemical Society, Inc. 107th Meeting of the Society. Sheraton-Gibson Hotel, Cincinnati, Ohio. (H. B. Linford, Secretary, E.S., 216 West 102nd St., New York 25, N. Y.)

May 4-6—Aircraft Trade Shows, Inc. Fourth International Aviation Trade Show. 69th Regiment Armory, New York. (E. Douglas, Public Relations Director, Hotel McAlpin, Broadway at 34th St., New York 1, N. Y.)

May 6—Ohio State University. Annual Conference for Engineers and Architects and Alumni Day. Columbus, Ohio. (Mars G. Fontana, ACE Publicity Committee, Ohio State University, Columbus 10, Ohio.

May 9-11—National Association of Corrosion Engineers. Spring Northeast Regional Corrosion Conference. Hotel Statler, New York City. (A. B. Campbell, Executive Secretary, N.A.C.E., 1061 M & M Bldg., Houston 2, Tex.)

May 12-13—Society for Applied Spectroscopy. Annual Meeting. Hotel New York, New York City. (G. L. Crumrine, Publicity, S.A.S., North American Smelting Co., Marine Terminal, Wilmington, Del.)

May 23-25—American Society for Quality Control. Ninth Annual Convention. Hotel New York, New York City. (A.S.Q.C., Room 5306, 70 E. 45th St., New York 17, N. Y.)

Explains How Alloying Affects Steel

A. R. Lytle (Left), Director of Research, Metals Research Laboratory, Electro Metallurgical Corp., Spoke on the "Effects of Alloying Elements in Steel" at a Meeting Held at Oak Ridge. Robert B. Oliver, technical chairman, is shown at right. (Reported by Anton deS. Brasunas for Oak Ridge)

Talk on Tools and Dies Featured at Cedar Rapids

Speaker: J. Y. Riedel

Bethlehem Steel Co.

J. Y. Riedel, toolsteel engineer, Bethlehem Steel Co., presented a talk entitled "Improving Production From Tools and Dies" at a meeting of the **Cedar Rapids Chapter** held recently. Mr. Riedel emphasized a positive approach to toolsteels by demonstrating what could be done to improve steel tools which are already producing satisfactorily. Since Mr. Riedel's talk has been written up in previous issues, it will not be repeated in full in this report.

Ben Peterson, professor of chemistry, Coe College, presented a talk on "What's New in Chemistry". He pointed out that it was up to the technician in the business world to take the leadership in the fight against a growing wave of anti-intellectualism and to restore proper balance between spiritual values and monetary values which is being destroyed because of people's pre-occupation with gadgets.—**Reported by Elmer M. Bruce for Cedar Rapids Chapter.**

Machinability Subject of Talk at Cedar Rapids Meeting

Speaker: Francis W. Boulger

Battelle Memorial Institute

The Cedar Rapids Chapter heard a talk on the "Metallurgical Aspects of Machinability" by Francis W. Boulger, chief of the division of ferrous metallurgy, Battelle Memorial Institute.

Mr. Boulger discussed the methods of measurement of machinability and the effects of environmental factors. He also described the physical properties of the work piece and their lack of correlation to machinability due to difference in methods of determination. He went on to discuss the important part which heat plays in the machining of metals, stating that about 97% of the energy expended in machining of metals is dissipated as heat. Since most of this heat derives from friction, the coefficient of friction is probably the most important factor in machinability. Such other factors as grain size and the inclusion of alloying elements, such as sulfur and lead, and the distribution of these elements were explained.

Mr. Boulger's talk was illustrated with graphs and drawings.—**Reported by Elmer M. Bruce for Cedar Rapids.**

ASM prepares and distributes on request, preprints of the technical and scientific articles presented at the annual convention.

Talk on Aluminum at Columbia Basin

The Columbia Basin Chapter Has Recently Completed a Course of Four Lectures on "Aluminum". Speakers and subjects were, from left: P. V. Faragher, Aluminum Co. of America, who presented two lectures on the "Physical Metallurgy of Aluminum"; M. J. Pryor, Kaiser Aluminum and Chemical Corp., who spoke on "Corrosion of Aluminum"; and Paul Brandt, Reynolds Metals Co., whose subject was "Designing With Aluminum". Pictured also are copies of the publications distributed to those enrolled in the course. (Reported by O. J. Wick for the Columbia Basin Chapter)

T-1 Steel Described at Texas Meeting

Porter R. Wray, United States Steel Co., Presented a Talk on "T-1 Steel—a Revolutionary Development in Structural Steels" at a Meeting Held by the Texas Chapter. At the speaker's table were, from left: Milton W. Phair, past chairman; Mr. Wray; and A. R. Oakley, Jr., Chapter chairman

Speaker: Porter R. Wray
United States Steel Corp.

Porter R. Wray, metallurgical engineer in charge of alloy steels for United States Steel Corp., and chairman of the Pittsburgh Chapter A.S.M., spoke before 110 members and guests of the **Texas Chapter.**

Mr. Wray's subject was "T-1 Steel—a Revolutionary Development in Structural Steels", and the talk was illustrated by many slides showing technical aspects of the new steel. A film on burst and impact tests on full-size pressure vessels made of T-1 steel was also shown.

T-1 steel, developed by U. S. Steel Corp., has a yield strength three times that of ordinary steel, with a minimum yield of 90,000 psi. in the quenched and tempered condition. Mr. Wray explained that to store 25,000 bbl. of volatile liquids in field-erected spherical tanks of carbon steel would necessitate the use of 25 1000-bbl. tanks. By using T-1 steel, the same job could be accomplished with one 25,000-bbl. tank.

Mr. Wray also described T-1 steel's ready weldability and explained how it can be flame cut without preheating or stress relieving. The usual after effects of welding—loss of ductility and tensile strength and increased embrittlement—are noticeably absent from T-1 steel when welded with the proper welding rod.

The steel has an outstanding resistance to the combination of impact abuse and abrasion, making it useful for heavy power shovels, dump cars, wind tunnels, earth-moving equipment, construction and industrial uses. It has exceptional toughness even at subzero temperatures. This quality was graphically illustrated by a film which showed cylindrical pressure vessels subjected to a drop test, with a 26,700-lb. weight being dropped from heights of 52, 73 and 101 ft. The vessels were 20 ft. long, 4 ft. in diameter, with welded hemispherical heads. The vessels were made of ½-in. thick T-1 steel plates quenched and tempered to meet the 90,000 psi. minimum yield strength and refrigerated to −45° F. The vessels withstood the first two drops, absorbing about 2 million ft. lb. and ruptured on the 101-ft. drop with a 100% shear along a 45° plane.—**Reported by Bob Blake for Texas Chapter.**

Engineering Conference To Be Held at Ohio State

The second Annual Conference for Engineers will be held at Ohio State University on Friday, May 6, 1955. The individual departments of the University will present research programs and hold an open house in the afternoon.

The program of the Department of Metallurgical Engineering will open at 2:00 p.m. in Lord Hall, Room 107, and will include the following papers:

Emission Microscopy—Its Future as a Metallurgical Research Instrument, by Erwin Eichen.

Passivity of Stainless Steel—Current Research in the Corrosion Laboratory, by William McKinnell.

Effect of Carburizing on the Fatigue Properties of an Aircraft Quality Steel, by Joseph Tompos.

Investigation of Cast Corrosion Resistant Alloys, by Norbert Greene.

Research Methods in the Development of Molybdenum Alloys, by W. L. Larsen.

High-Temperature Effects of Boron in Steel, by R. M. Goldhoff.

Developments in the Department of Metallurgy, by Mars G. Fontana.

The program of the Metallurgy Department will close with an inspection tour of the research projects and laboratories.

The Department of Welding has scheduled the following sessions, to be held in Room 132, Industrial Engineering Building:

Welding Engineering at O.S.U., by Roy B. McCauley.

Commercial Quality for Aluminum Spot Welds, by Frank Kuncz, Jr.

Recent Advances in the Field of Nondestructive Testing, by R. C. McMasters.

At North Texas President's Night

Pictured at the President's Night Meeting Held by the North Texas Chapter are, from left: John M. Turbitt, Chairman, George A. Roberts, A.S.M. National President, and A. S. Holbert, Chapter Treasurer. Dr. Roberts gave a talk on "Toolsteels—New Developments and Applications" and a brief resume of headquarter's activities. (Reported by Robert E. Hopper)

Briefs Columbus Chapter on Recent Cermet Developments

Speaker: John C. Redmond
Kennametal, Inc.

Members of the **Columbus Chapter** heard John C. Redmond, vice-president, Kennametal, Inc., present a talk entitled "Recent Developments in Cermets" at a recent meeting.

The speaker first discussed the fundamental concepts of cermets. With demands for materials to withstand increasingly severe service requirements in high-temperature applications in recent years, metallurgists could foresee limitations to the use of metal alloys. They cast wistful glances at some of the ceramic materials with their high melting points, very high resistance to oxidation and high strengths under compressive loads. However, there was a need to improve on certain properties of the ceramics, such as thermal-shock resistance, impact resistance and ductility. The development of cermets, particles of refractory materials bound together with a suitable metal or alloy, for use in elevated-temperature service, was an attempt to combine the better properties of metals and ceramics and to bolster the poorer properties of each. The speaker evaded defining the term cermets, only going so far as to say that some people claim, if it isn't a metal or an organic material, it's a cermet.

Mr. Redmond's talk emphasized the titanium carbide-base cermets. Among the ceramic materials, the refractory-metal carbides have the highest melting points; that of titanium carbide is 5684°F. Tungsten-carbide cemented carbides have been in use since the 1920's. Oxidation of tungsten carbide becomes quite a problem at temperatures above 1400° F. This is further complicated by the fact that the oxide coating has no abrasion resistance. Titanium carbide itself has little resistance to oxide penetration. However, titanium carbide with a metal binder has much better resistance to oxidation. If a little of the titanium carbide is replaced by columbium carbide, a 20-fold improvement in oxidation resistance results. The resistance to oxidation is very good at temperatures up to at least 2200° F., and oxidation is not catastrophic at temperatures up to 3000° F. The columbium carbide does not improve the strength of the cemented titanium carbide but merely alters the properties of the oxide coating formed at the surface.

Cemented TiC is noteworthy for its low density, a relatively low coefficient of thermal expansion, a thermal conductivity double that of the superalloys, and a compressive strength of approximately 550,000 psi.

Whereas the energy absorbed in the standard Charpy impact test is about 50 ft.-lb. for the alloys used in high-temperature service, that for the best cermets is not over 10 ft.-lb. Titanium-carbide base cermets have the highest impact strength yet achieved in cermets.

Among the interesting applications of titanium-carbide base cermets are turbine blades for jet engines and impellers and nozzle rings for service up to 1900° F., high-temperature bearings and seals, skid rails for service inside induction-heating coils, wear rings on scarfing torches, extrusion dies for certain kinds of metals and anvils for electric upsetting machines used to up-set blanks prior to forging. Cemented titanium-carbide guides for the rods in rod-rolling mills have lasted 3000 hr., while the bronze guides that they replaced had a life of only 8 hr.—**Reported by Ellis Fletcher for Columbus Chapter.**

Advantages of Steel Castings As Engineering Materials

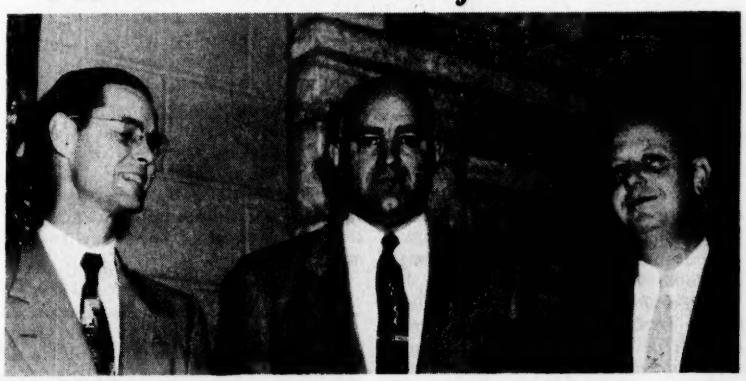
Speaker: Charles W. Briggs
Steel Founders' Society of America

Charles W. Briggs, research director, Steel Founders' Society of America, presented a talk entitled "Design and Value of Steel Castings as Engineering Materials" in **Toledo.**

Mr. Briggs began by emphasizing that castings offer uniform properties regardless of direction, in contrast to other available steels, and that they have been in use for over a century. Sound engineering design and good foundry practice must be combined to achieve the maximum usefulness of material. With variations of alloys and control of grain size, many variations of materials and properties are available. Composite and cast-weld structures further increase flexibility of casting design.

Mr. Briggs pointed out both general theory and specific applications of these principles in the film and slides he used to illustrate his points. —**Reported by H. K. Hybarger for Toledo Chapter.**

Pearlitic Malleable Subject at Peoria



From Left: James W. Cantwell, Chairman of the Peoria Chapter, Eric Welander, Chief Metallurgist, John Deere Malleable Co.; and Mr. Rousch, of John Deere Malleable Co., Discuss Mr. Welander's Talk on "Pearlitic Malleable" During a Meeting Held Recently by the Peoria Chapter

Speaker: Eric Welander
John Deere Malleable Co.

Members of the **Peoria Chapter** heard Eric Welander, chief metallurgist, John Deere Malleable Co., deliver an address entitled "Manufacturing Methods and Metallurgy of Pearlitic Malleable" recently.

Mr. Welander explained that this series of alloys contains combined carbon in various forms in the matrix, thus differing from normal malleable iron in which the matrix is ferritic. Pearlitic malleable iron is produced either by stopping the heat treatment before the combined carbon has all been transformed to graphite or by reheating normal malleable above the transformation range. Sometimes, it is more convenient to add a retarding alloy, such as manganese, and then carry on the normal annealing cycle.

The pearlitic malleable irons that seem to be the most generally useful are those in wh'ch the cementite is present in the form of spheroids. Slides were shown by the speaker which illustrated and compared the various microstructures. Depending on the amount of combined carbon retained and the form of its distribution, the properties of the resulting product will vary. The tensile and yield strength are always higher than for normal malleable iron and the ductility and impact resistance are lower.—**Reported by John G. Frantzreb for Peoria.**

Status of Titanium Topic at Pittsburgh

Loren Smith, Cornell Aeronautical Laboratory, Spoke on the "Current Status of Titanium" at a Meeting of Pittsburgh Chapter During Which Special Metallurgical Awards Were Presented to Harold Priestley, University of Pittsburgh, and Paul C. Borland, Carnegie Institute of Technology. Shown, left, are: A. J. Berger, University of Pittsburgh; Mr. Smith; Porter R. Wray, Chapter chairman; W. O. Philbrook, Carnegie Institute of Technology; and Mr. Priestley and Mr. Borland, winners of the awards

Speaker: Loren W. Smith

Cornell Aeronautical Laboratory

Loren W. Smith, head of the metallurgy section, Cornell Aeronautical Laboratory, discussed the "Current Status of Titanium" at a meeting of the **Pittsburgh Chapter.**

Titanium, although only recently available in the metallic form, is the fourth most abundant element in the earth's crust. The 1954 production of metallic titanium sponge was approximately 2000 tons, which sold in this form for $4.50 to $5.00 per lb. Production of sponge is encouraged by favorable tax write-off features as needed facilities and by the government purchase of the metal for stockpiling. A production of 8000 to 10,000 tons in 1955 and 25,000 tons in 1958 is predicted.

Because of the present price of wrought titanium, namely $20 to $30 per lb. on finished sheet with no scrap value, it is being used in significant amounts only by the aircraft industry. Studies are being made with titanium and its alloys in the compressor end of jet engines and for bulkheads, firewalls and other fuselage members of military planes. The only commercial plane using titanium at present is the DC-7, in which approximately 528 lb. of titanium is used for shrouds, resulting in an increased payload of 200 lb. Titanium alloys may be useful for high-strength bolting materials when manufacturing and service problems are solved.

The strength-weight ratio of titanium alloys is the highest of available metals at temperatures from 250 to 600° F. It may be used, therefore, at temperatures above the limits for aluminum. At higher temperatures, it is necessary to use stainless steel.

Titanium can be readily forged at 1750° F. The annealing temperature is 1200° F. It may be rolled similarly to stainless steels and can be hot formed and cold formed by those who have acquired the know-how. Heilarc welding has been successfully used on unalloyed titanium. Titanium is very difficult to cast to shape because of the reactivity of the molten metal with all common refractories. Some progress is being reported on casting small parts with specialized apparatus and materials.

Other than cost, the material offers problems arising from the nonuniformity of properties from lot to lot and the variations of the response to stress relief anneals. Examples of specific cases where these problems exist were described by Mr. Smith. Improvement in the properties of recently produced titanium was noted.

Battelle Memorial Institute has received a contract from the government to act as a trouble-shooting laboratory for the users of titanium and to assist in preparation of more desirable specifications for titanium and titanium alloys.

The expanding capacity for the production of titanium and the broad research and development projects that are currently in progress present a bright future for titanium.

During the meeting, special metallurgical awards were presented to Harold Priestly, University of Pittsburgh, and to Paul Borland, Carnegie Institute of Technology.—**Reported by Earl Weaver for Pittsburgh.**

operates a no-cost employment service for its members and industry.

Canton-Massillon Hears Unionism Talk

The Canton-Massillon Chapter's Sustaining Members Night Meeting Featured a Talk by William E. Umstattd, President, Timken Roller Bearing Co., on "Dangers Inherent in Compulsory Unionism". Pictured are, from left: R. Wilson, director of metallurgy, Timken Roller Bearing Co., A. S. M. past president; Mr. Umstattd; F. J. Welchner, chairman; D. J. Girardi, past chairman; and W. E. Ellis, treasurer. (Reported by W. E. Littmann)

Industrial Heating Equipment Officers Meet

Directors and Officers Attending the Annual Meeting of the Industrial Heating Equipment Association Held in Detroit Recently Included, From Left, First Row: L. H. Gillette, Westinghouse Electric Corp.; Horace Drever, Drever Co., President; and R. E. Whittaker, Swindell-Dressler Corp. In second row, from left: Curt Vaughn, Electric Furnace Co.; Les Shea, Lindberg Engineering Co.; Norman Davies, North American Manufacturing Co.; William Benninghoff, Tocco Division, Ohio Crankshaft Co.; Walter Holcroft, Holcroft & Co.; and Elton Staples, Hevi Duty Electric Co., vice-president. (Photograph by Stanley Wishoski)

Forecast on Nuclear-Powered Automobile Given at Washington

Speaker: W. D. Manley

Oak Ridge National Laboratory

W. D. Manley of the Oak Ridge National Laboratory presented aspects of the new look in metallurgy at a meeting of the **Washington Chapter** in an account of the designing of an imaginary atomic-powered automobile engine as part of his talk, "Materials Problems in Reactors". He introduced his audience to reactors and to the concepts of metallic fuels and coolants, radiation shields, controls, moderators and neutron cross section.

Uranium as a source of energy and a fuel is no longer a novelty. But to keep the products of fission and the resultant radiations in bounds, physically and energetically, all metals used must be selected and tested for unconventional properties. For example, thermal neutron cross section, the property of slowing neutrons, would be very important in an atom-powered automobile. The thermal neutron cross section of gadolinium is 36,000, the unit being the square fermi or 10^{-24} sq. cm.; another high value is 8000 sq. fermi for tin. For cadmium it is 3000, for boron 715, and for other elements lower values hold.

The high-speed neutrons generated in a fissioning fuel, to be useful in an automobile, must be slowed down to thermal values or "thermalized". This can be done by surrounding the fuel with a moderator, which may be of such materials as beryllium and its compounds, graphite, hydroxides or hydrocarbons. New concepts of the purity of metals enter at this point. Small traces of elements of high neutron-absorbing cross section obviously would be as important as large quantities of elements of low cross section in removing neutrons entirely from the reaction, and such impurities must be painstakingly removed.

To keep the new engine in control, shim rods and shields would be necessary. A flame is controlled by the amounts of fuel admitted to the engine, but the rate of power generation by fissioning would be controlled by means of the effective working size of the basic power plant. The control rods and shields would have high neutron-absorbing cross sections, and emelents such as gadolinium, hafnium, boron or cadmium colld serve.

The fission energy, before it can be used for power, must be transferred to a mechanical power-generating unit. This can be done by using low-fusing metals, such as calcium and lithium, in heat exchangers, but the walls must be able to withstand both the high temperatures attained and the coolant fluid. Outright conventional corrosion may occur in the heat exchanger; or, the hotter portion of the coolant may dissolve the container wall and subsequently the solute may deposit on the walls of the cooler parts of the exchanger as crystals. Experiment is the only guide in this problem.

Corrosion as a problem is not limited to the heat exchanger; it occurs with the fuel itself. Uranium at elevated temperatures must be enclosed in sealed protecting capsule that prevents entry of corrosive agents, particularly the coolant, on one hand, and on the other permit transmission of useful radiations and heat.

Outside the new engine, both the auxiliary parts of the automobile and the driver and passengers would have to be protected by shields from the dangerous radiations. For gamma radiation, high density would be the desired property. Gold, iridium and osmium would all be useful. Mr. Manley did not indicate the price range of his new car.—**Reported by H. E. Stauss for Washington.**

Delivers Burgess Memorial Lecture

Jerome Strauss (Right), Vice-President, Vanadium Corp. of America, Is Shown as He Received the Burgess Award Certificate of the Washington Chapter From Richard E. Wiley, Chairman. Mr. Strauss presented a discussion on "High Strength Cast Iron — An Appraisal and Forecast"

Speaker: Jerome Strauss

Vanadium Corp. of America

The sixth annual George Kimball Burgess Memorial Award Lecture of the **Washington Chapter** was presented by Jerome Strauss, vice-president, Vanadium Corp. of America. Mr. Strauss gave a talk entitled "High Strength Cast Iron—An Appraisal and Forecast".

Mr. Strauss pointed out that the subject of cast iron is exceedingly complex, and that the desire for control of the many variables has supplied the driving force in the search for improvement. Early recognition of the benefits to strength resulting from low carbon content due to large steel scrap additions to the cupola charge, and of the value of a completely pearlitic matrix microstructure, led to reported strengths up to 70,000 psi. Study of high melting temperatures established that strength increased with increase of holding temperature, and that the benefits persist in larger sections up to 3 in. in thickness. In the history of inoculation of cast iron, Mr. Strauss believed that credit for priority belonged to Meehan, who treated iron with calcium silicide, producing high strength gray iron from metal that otherwise would have cast white. The most efficient inoculants are rich ferrosilicon and complex agents, usually with a high silicon content.

Interwoven with the other changes in production practice have been the contributions to high strength resulting from the use of alloying elements, the principal metals in use by the iron foundryman being chromium, vanadium, manganese, molybdenum, copper and nickel. For ability to deform under occasional overload, first rank is taken by malleable cast iron. Over the years a number of close relatives have appeared that require a shorter heat treatment.

The discovery by Morrogh and by Millis, Gagnebin and Pilling, of methods for producing iron castings with the graphite in spherulitic form has opened a new vista in ferrous metallurgy, Mr. Strauss declared. Strength values, as cast, range from 60,000 to 120,000 psi., with elongations in the tension test of 3 to 20% in the reverse order. Methods of production add cerium to irons low in sulphur, or use magnesium for sulphur above 0.02%. Under the pressure of cost decrease, semi-nodular irons that have part of their graphite as stubby flakes, part as spheroids, are being investigated.

Past accomplishments have made cast iron a material of varied uses. One cannot help looking forward to further changes and improvements. If control of graphite shape and distribution can be effected more fully, Mr. Strauss predicted that tensile strengths close to 200,000 psi. may be possible, with measurable elongation.—**Reported by H. E. Stauss for Washington Chapter.**

Reports on Vacuum Melted Metals at Syracuse Meeting

Speaker: James H. Moore

Vacuum Metals Corp.

James H. Moore, general manager, Vacuum Metals Corp., spoke on "Vacuum Melted Metals" at a meeting held by the **Syracuse Chapter.**

Dr. Moore described the process of melting steel and some nonferrous metals while under a vacuum and showed detail diagrams of the pumps necessary to secure and maintain the vacuum.

Performance records of alloys made by the vacuum process and electric furnace method were discussed. The fatigue properties of vacuum melted steel appear to be much higher than previously experienced.—**Reported by L. L. McArthur for Syracuse Chapter.**

Notre Dame Student Wins Scholarship

Charles Antrobus, Winner of an A. S. M. Scholarship, Is Shown Receiving the Award During a Meeting of the Notre Dame Chapter. J. D. Robinson, vice-chairman of the Notre Dame Chapter, made the formal presentation

Lincoln Explains Incentive Plan at Purdue Meeting

Speaker: James F. Lincoln
Lincoln Electric Co.

James F. Lincoln, chairman of the board, Lincoln Electric Co., presented a talk on "Incentive Management in the Metals Industry" at a meeting held by the **Purdue Chapter.**

The Lincoln Electric Co. has one of the earliest and most successful incentive management plans in the United States. It is a philosophy of management developed over the past 40 years. Its outstanding success Mr. Lincoln attributes to a wholehearted acceptance of a fundamental philosophy. Even in this era of enlightened management, most companies are organized with profit as the principal objective. This is the wrong approach, according to Mr. Lincoln. The principal objective of industry is to market a better product—not profit alone.

No employee will strive for management's profits. There is no motivation for improved production when management's profit is the only goal. The "profit only" principle creates the opinion that management's gain is the employee's loss, with the resultant attitude of resistance to maximum production. The feeling that one may "work himself out of a job" is introduced.

Recent social studies indicate that man generally uses slightly less than one-half of his potential talents and efforts. If only a means were available to raise the employee's output to 75 or 100% of his potential! The device for increased output is participation. Participation in his company's problems, goals and profits will make him a part of the company—he belongs—not merely a hired worker. An incentive management plan, Mr. Lincoln declared, will increase participation, production output and, equally important, personal pride. Then nearly 100% of potential can be realized.

Is this a "do gooder" benevolent plan? Does this lead to a paternalistic relationship? No, says Mr. Lincoln, it's just good business. At Lincoln Electric, sufficient profits are always available to be divided, as follows: 6% dividends on assets, a certain percentage to development and research and the balance to employees as incentive pay. The employees share is paid as a single cash payment at the end of the year. The average pay at Lincoln is $8000.

Lincoln Electric Co.'s incentive philosophy places improved production at lower cost as the principal aim. Each employee has a direct responsibility and interest in suggesting and improving cost-saving methods. No employee has ever been terminated because of a labor-saving innovation. The plan includes guaranteed employment. This security is very valuable; why would an employee suggest a cost-saving method if he or his friend will be discharged as a consequence.

As costs are reduced, prices are reduced. Profit margin is constant. Annual goal is 10% cost reduction in direct labor. This program makes sense to employees. Each employee's share of incentive pay is determined by a merit rating. He thus is rewarded directly in proportion to his contribution. The merit ratings vary from 35 to 130%, with the average about 90%. This means that the average employee who makes, for example, $4000 per year, will get an additional $3600 as his participation share. It is possible that an employee with a high rating and lower base pay may actually have a larger total yearly share than another higher base employee. Thus, an employee with a $6000 base pay and 70% incentive rate would realize a $10,200 total income, while a $5000 base pay and 110% incentive rate would realize a $10,500 total income.

Are employees satisfied with their annual ratings? No!, stated Mr. Lincoln, thank God they are not. There would be no incentive if satisfaction crept in. Constant competition is always present between employees, between foremen and between departments. The absence of competition and incentive produces stagnation.

The total benefits of the incentive plan produce the following advantages: Higher morale and self pride of employees; improved product; increased production; lower costs; and lower prices.

The byproduct of these advantages is the greater profit that is shared by all employees as incentive pay. No, it is not a "do gooder" plan, it's just good business, stated Mr. Lincoln.—**Reported by Joseph J. Phillips for Purdue Chapter.**

Lectures on Heat Resisting Alloys

At a Meeting of the Chattanooga Chapter, Roger C. Sutton, Senior Metallurgist at the Argonne National Laboratory, Spoke on the "A.B.C. and I.O.U. of Heat Resisting Alloys". Shown are, from left: Mr. Sutton, Ab Flowers, chairman; and Walter D. Neisz, technical chairman of the meeting

Speaker: Roger C. Sutton
Argonne National Laboratory

The **Chattanooga Chapter** heard Roger C. Sutton, senior metallurgist, Argonne National Laboratory, speak on "The A.B.C. and I.O.U. of Heat Resisting Alloys".

The A.B.C. portion of Mr. Sutton's talk consisted of some fundamental definitions and properties of heat resistant alloys. Defining such as alloys of iron, chromium and other elements, Mr. Sutton gave as their properties their protective oxide film for corrosion resistance, their good strength at high temperatures, high melting points, their stability and the fact that their coefficients of expansion and that of their oxide film are the same.

Such alloys are obtained by the addition of nickel to an iron-chromium base. Chromium insures the protective oxide film, while nickel makes the alloy austenitic and prevents phase change. The high-nickel alloys, such as 35-15, are useful for severe thermal fatigue or reducing atmosphere usage.

Turning to the I.O.U. part of his talk, Mr. Sutton showed how sharp corners are focal points for stresses, both in heating and cooling.

He then showed how we can get away from such corners by designs using round and curved members. Stating that thermal loads are more damaging than physical loads, Mr. Sutton showed how castings with rounded intersections and cores at intersections can eliminate corners as a focal point for thermal loads. His designs were illustrated with slides showing actual castings whose parts carried out his approach to the letters I. O., and U. in rounded, curved and hollow cross section.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Meet Your Chapter Chairman

R. P. Griffenhagen

W. A. Granquist

J. E. Preas

PEORIA

JAMES W. CANTWELL, engineering materials supervisor, Caterpillar Tractor Co., graduated from Rose Polytechnic Institute in 1933 with a B.S. degree in mechanical engineering. He was employed in the plant engineering department of Wheeling Steel Co., before joining Caterpillar in 1934. He rose to a supervisory position in heat treating in 1937.

Entering the armed forces three years later, he served in the Corps of Engineers and later in Ordnance, where he advanced to the rank of major. He returned to the heat treat department at Caterpillar in 1943, and subsequently transferred to engineering, where he is now employed.

A native of Carbon, Ind., Jim is married and the father of a boy. He has served on various committees of the Peoria Chapter, and is a member of the American Ordnance Association and past secretary of the Toastmasters Club of Peoria.

He enjoys such hobbies as photography, metalworking and woodworking, and expresses interest in basketball and baseball.

BUFFALO

RAYMOND P. GRIFFENHAGEN, manager, materials and process section, Motor and Control Division, Westinghouse Electric Corp., was born in Chicago. He obtained his B.S. in chemical engineering from Purdue University in 1938. He worked as an atmosphere heat treating and furnace brazing engineer in the feeder engineering department at Westinghouse and as a metallurgical laboratory foreman and section manager of the materials engineering department before being assigned to his present position.

Ray is married and has three children, David, 10, Susan, 8, and Anne, 2. He has served on the Buffalo Chapter's executive committee for four years, including one year as treasurer and one year as program chairman, and is on A.S.T.M.'s Committee B-1 on electrical conductors. He enjoys a good golf game, church and Y.M.C.A. activities.

KANSAS CITY

WILLIAM F. ALDERSON, general supervisor, materials laboratories, Buick-Oldsmobile-Pontiac Assembly Division, General Motors Corp., is a native of Ashland, Ky., where he was born in 1915. He graduated from Chrysler Institute of Engineering in 1951 with a metallurgy and chemistry degree and served in various General Motors departments prior to assuming his present position. While in school, Bill participated in football and track activities, and in 1936 he went to the Golden Gloves semi-finals.

Married and the father of a 13-year old daughter, Bill is a member of several technical and social organizations. He has served on the board of directors, Society for Nondestructive Testing, and as a member of A.S.T.M. Committee E-7. His spare-time interests are divided among baseball, golf and magic.

DES MOINES

W. A. GRANQUIST was born in Des Moines, Iowa, in 1920. He spent 1½ years at Dowling Junior College in Des Moines, and took special courses in sheet metal, blueprint reading and drafting at Dale Carnegie Institute. He earned letters in both football and boxing while at school.

Mr. Granquist, who is married and has three children, is presently laboratory X-ray supervisor for Solar Aircraft Co. He is a member of several social and civic organizations, and likes to hunt, play or watch baseball and work in his home woodwork shop. He spends a great deal of time working with juvenile delinquents.

Mr. Granquist served with Company C., 385th Infantry Regiment, 76th Dvision in the European Theater during the war.

TOLEDO

JOHN E. PREAS was born in Harrisburg, Pa., and attended Toledo University, where he was on the football team. His first job out of school was as a hardware store clerk. He is presently district manager at the Toledo office of Latrobe Steel Co.

John is married and has three children, Eleanor, age 12, Charles, age 10, and John, Jr., age 7. He is a member of the Toledo Zoological Society and enjoys a game of golf, baseball and football when he can find the time.

DAYTON

IRVING H. SCHAIBLE, metallurgical engineer, Apex Machine & Tool Co., was born in Lansing, Mich., and attended Michigan State College. His first job was in the metallurgical department of U. S. Steel Corp.

Irving and his wife have two children, and he is a member of the Engineers Club of Dayton and the National Association of Foremen. He has been a member of A.S.M. for the past 17 years and has served his chapter in various capacities throughout the years. He enjoys all sports.

MINNESOTA

ANDREAS LUKSCH, senior project engineer, G. H. Tennant Co., was born in Vienna, Austria, in 1903, and educated in Hamburg, Germany. He received his engineering degree in Danzig and his M.A. and Ph.D. degrees from the State University of Iowa. He competed in sailing races on the Baltic Sea while in Danzig, and was active in skiing and track activities.

Andreas' first job was as assistant to a professor doing hydraulics research, and he subsequently worked at a cable factory in Germany before coming to the U. S.

Andreas is single. He is a member of honorary and technical organizations, and has been active in Minnesota Chapter affairs in various capacities. His present off-work interests are hunting, skiing, painting, music and languages.

I. H. Schaible

J. W. Cantwell

W. F. Alderson

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	May 18	Mayflower Hotel	E. H. Jeffries	Furnace Equipment
Baltimore	May 16	Engineers Club	M. F. Tisdale, Jr.	Rare Earth Metals
Boston	May 6	M.I.T. Faculty Club	M. C. Shaw	Machining of Metals
Calumet	May 10	Phil Smidt's		Industrial Applications of Atomic Energy
Canton-Massillon	May 3	Mergus Restaurant	G. A. Roberts	National Officers Night
Carolinas	May 19	Salisbury	Peter P. Payson	Steels for Service at Ultra-High Strengths
Cedar Rapids	May 10	Roosevelt Hotel	A. E. Focke	Mechanical Testing
Chattanooga	May 17	Maypole Restaurant	John H. Frye, Jr.	Metallurgical Problems in Nuclear Reactors
Cleveland	May 2	Hollenden Hotel	Mary Flahive	Gem Cutting as a Hobby
Columbus	May 4	Broad St. Church	C. Faust	Surface Protection of Metals
Dayton	May 11			Golf Stag
Detroit	May 9	Rackham Memorial Building	Morris Cohen	Tempering of Steels
Eastern New York	May 10	U.S.O. Hall	J. J. Vrooman	Annual Meeting
Golden Gate	May 9	Westinghouse Mfg. Co.		Plant Visit
Hartford	May 10	Indian Hill Country Club	E. C. Clark and E. W. Lobkowski	Impact Forging
Indianapolis	May 16	McClarney's Restaurant	J. D. Graham	Metallurgical Analysis of Failures
Jacksonville	May 9	Hotel Seminole	A. W. Hess	New Aluminum Alloys
Lehigh Valley	Apr. 29	Hotel Traylor	Social	Annual Dinner Dance
Louisville	May 3	River Rd. Country Club	Social	Ladies Night
Mahoning Valley	May 10			Plant Visit
Manitoba	May 12	Vasa Lund		Annual Meeting
Montreal	May 2	Queen's Hotel	Carol Lane	Annual Ladies Night
Muncie	May 10	New Castle	Richard Seelig	Chromizing
New Haven	May 19	Waverly Inn		Civilization Through Tools
New Jersey	May 16	Essex House	H. N. Alyea	Atomic Energy
New York	May 9	Schwartz's Restaurant	T. W. Lippert	Fabrication and Uses of Titanium and Its Alloys
Northeast Pennsylvania	May 12	Irem Temple Country Club	Social	Ladies Night
Northwestern Pennsylvania	May 19		Social	Ladies Night
Notre Dame	May 11	Engineering Building	R. P. Hunnicutt	Metallurgy of Bearing Metals
Oak Ridge	May 11	U. T. Student Center	Robert G. Chapman	Gems
Ontario	May 6	Royal York Hotel	R. Smallman-Tew	Stump the Experts Night
Ottawa Valley	May 3	P.M.R.L.	W. A. Mudge	Commercial Age Hardenable Alloys
Philadelphia	May 12	Engineers Club	A. W. Grosvenor	Microstructure
Juniors	May 12	Engineers Club		Joint Meeting With Senior Group
Pittsburgh	May 12	Gateway Center Restaurant	T. W. Merrill	
Purdue	May 17	Purdue Memorial Union	C. W. Ooms	Patent Law and Metallurgy
Rhode Island	May 4	Eng. Soc. Bldg.	Harry Dixon	Newer Casting Techniques
Rochester	May 9	Elks Club		Annual Meeting
Rocky Mountain	May 20	Oxford Hotel	H. E. Van Valkenburg	Ultrasonic Inspection of Materials
Rome	May 2	Elks Club	W. Naujoks	Forging
St. Louis	May 20	Forest Park Hotel	Panel	Stump the Experts Night
Saginaw Valley	May 17	Frankenmuth Hotel	H. R. Lissner	Ladies Night
San Diego	May 19	Solar Aircraft Auditorium	Paul D. Frost	Heat Treatment of Titanium
Springfield	May 16	Blake's Restaurant	Panel	Heat Treatment of Steel
Texas	May 27	Ben Milam Hotel	Social	Golf Tournament
Toledo	May 12	M.R.Y.C.	A. H. Koch	Old Timers Night
Tri-City	May 3	Rock Island Arsenal	E. O. Dixon	Forgings—Their Place in Design and Manufacture
Utah	May 26	Officers Club Fort Douglas	Social	Spring Festival
Warren	May 12	El Rio Restaurant	Don Babcock	Recent Developments in Steel
Washington	May 9	Naval Gun Factory	G. A. Roberts	New Developments in Toolsteels
Western Ontario	May 27	Mario's Tavern		Forgings
	May 13		Social	Field Day
Wichita	May 17	K. of C. Hall		National Officers Night

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Metal Cutting Course — The metal processing division of the department of mechanical engineering, M.I.T., is offering a course in the general field of metal cutting and lubrication for two weeks, starting June 27, 1955. The program will present advanced material, using work presented in past summer sessions as a foundation, and those attending will participate in small groups in laboratory research experiments. Write to M.I.T. for full details, care of Prescott A. Smith.

Vacuum Furnace—Consolidated Vacuum Corp. has announced shipment to the metallurgical development laboratory of Westinghouse Electric Corp., of the first, modular-type, 1000-lb. capacity high-vacuum furnace. This furnace offers maximum flexibility in operational technique and provides economical expansion to larger capacities.

Propeller Agitation—U. S. Steel has put out a booklet, "Improved Quenching of Steel by Propeller Agitation", which is offered as a service to those requesting a copy from U. S. Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa., so that the advantages of propeller agitated quenching may make possible substantial savings by promoting optimum heat treating performance.

Nuclear Engineering Course—Undergraduates in the College of Engineering at Ohio State University are being offered a background in the fundamentals of nuclear engineering through a special course which is being introduced this Spring. The course will include basic nuclear physics and primary elements of reactor technology.

New Facilities Announced—Applied Research Laboratories have completed facilities for the design and manufacture of X-ray and gamma-ray optical elements and instruments. J. W. M. DuMond, California Institute of Technology, will act as consultant for the laboratory's new service.

Consolidation — Babcock & Wilcox Co., Tubular Products Division, has announced the consolidation of the former sales office of the Globe Steel Tubes Co. in Cleveland with the district sales office of B & W's Tubular Division. The new office will be under the supervision of James A. Cook, and will handle sales of the Division's seamless and welded stainless, carbon and alloy steel tubular products as well as Globe seamless welding fittings.

Appoints Representative — Gas Machinery Co. has announced the appointment of Heat and Control, Inc. as its representative on the West Coast for the firm's Industrial Furnace Division.

Sells Warehouses — Hamilton Steel Co. has sold its steel and aluminum warehouse business to Jones & Laughlin Steel Corp. Hamilton will continue business under the Hamilton name, and J & L will have warehouse facilities in Cleveland to help service midwest customers.

Selective Absorbents — Linde Air Products Co. has announced the development of two selective absorbents which will provide industry with a completely new basis for the separation and purification of mixtures of gases or liquids. Called molecular sieves, these new materials are man-made crystalline zeolites which separate mixtures of gases or liquids on the basis of the difference in molecule size. They do not collapse as other zeolites do, and show marked affinity for both polar and unsaturated molecules.

Electron Microscope Course—The department of engineering physics, Cornell University, is offering a summer laboratory course in the techniques and applications of the electron microscope, from June 13 to June 25, 1955. The course is designed as an intensive survey of basic theory and interpretation of results. Further inquiries should be sent to: Benjamin M. Siegel, Engineering Physics Dept., Rockefeller Hall, Cornell University, Ithaca, N. Y.

Scanning Spectrometer—Applied Research Laboratories have announced a nondestructive X-ray scanning spectrometer, suitable for qualitative or semiquantitative analysis. Liquids, powders and metals can be analyzed quickly, standard samples last indefinitely and little sample preparation is required under the new X-ray methods.

Printing on Steel—Pannier Corp. engineers have developed an ink for printing steel sheet products. Known as Grade 1001-S, and made in various colors, the paint has withstood tests in a weathermeter machine for a period of more than 840 hr., equal to 840 days out in the weather.

Talks on Residual Stresses in Chicago

From Left, J. A. Kubik, Chairman, John A. Halgren, Technical Chairman, R. L. Mattson, Research Laboratories Division, General Motors Corp., Who Spoke on "Residual Stresses", and C. H. Samans, Vice-Chairman, Are Shown During a Meeting of the Chicago Chapter. Mr. Mattson pointed out the relationship between residual stresses and bending fatigue properties and the spalling type of surface failure. (Reported by C. W. Saenger)

Gives Reasons Why Aluminum Continues To Meet Competition

Speaker: E. H. Dix, Jr.
Aluminum Co. of America

"Aluminum Continues to Meet Competition" was the title of a talk presented at Sustaining Members and Old Timers Night of the **Los Angeles Chapter** by E. H. Dix, Jr., assistant director of research, Aluminum Co. of America.

Before World War II (1939), 375 million lb. of primary aluminum was produced, practically all by Alcoa, whereas in 1950, 1455 million lb. and 1954, 2900 million lb., of which Alcoa produced 50 and 40% respectively.

Mr. Dix discussed some of the company's 39 facilities for producing aluminum and aluminum products, including smelting and reduction, foil, sheet, plate, extrusion, forging, casting, wire, rod and bar mills. In order to meet competition, cheap power is essential . . . 10 kw. hr. is required per lb. of aluminum. Alcoa pioneered water power and, in addition, is now using natural gas and lignite.

Research and development is all-important to meet competition. Since World War II, Alcoa has spent 7 million dollars annually on research and development, which in 1954 amounted to approximately 2.7% of their sales dollar.

Inherent characteristics of aluminum and its alloys include high strength-weight ratio; high electrical and thermal conductivity; high resistance to corrosion (no staining); nonmagnetic and nonsparking qualities.

Mr. Dix said that in construction of the Alcoa Building in Pittsburgh (1953), 3000 tons of steel was saved by using curtain-wall structure. The facing sheet has a cladding of silicon alloy which, when given a protective electrochemical coating, produces a pleasing color of slate gray. Alcoa is now producing eight architectural colored finishes, and more than 100 aluminum-faced buildings are under construction or planned.

New developments include a special aluminum-zinc alloy for cathodic protection of steel ship hulls, and a high-strength electrical bus bar with minimum tensile strength of 29,000 psi. and conductivity of 57%. Wrought aluminum-magnesium alloys 5154 and X5356 are available for inert-gas-shielded arc welded structures. XC355 and XA356 permanent mold casting alloys of high purity develop exceptional elongation values. XA140 is a new casting alloy for elevated temperature applications. The Alcoa plaster casting process gives intricate aluminum parts with thin cross sections, excellent surface smoothness and accurate dimensional tolerances.

Aluminum powder metallurgy (APM) products, which are compacted as ingots, extruded and then rolled or forged, have excellent elevated-temperature properties. The insoluble aluminum oxide present in this product prevents loss of properties at temperature.

A new aluminum forging alloy, X7079, has been developed. It is less sensitive to rate of quenching than its counterpart 7075 and develops uniform properties throughout sections up to 7 in. thick with minimum elongation of 4% in the short transverse direction. — **Reported by Alfred P. Binsacca for Los Angeles.**

Receives Plaque for Service Record

John L. Hartz (Left), Chief Metallurgist for the Parish Pressed Steel Division of Dana Corp., Was Presented a Memorial Plaque by H. B. Bartlett, (Right), Dana Vice-President and General Manager at Parish, in Honor of His Record of 42 Years With the Company Without a Day's Absence Due to Illness. Howard S. Lewis (Center), retired Parish president, one of the earliest members of the Lehigh Valley Chapter, of which Mr. Hartz is also a long-time member, was also present when the award was given

Lists Advantages of Modern Salt Bath Furnaces for Peoria

Speaker: L. B. Rosseau
Ajax Electric Co.

At a meeting of the **Peoria Chapter**, L. B. Rosseau, vice-president in charge of engineering, Ajax Electric Co., presented a talk entitled "Modern Salt Bath Furnace Designs and Their Commercial Use." Mr. Rosseau discussed his experiences with electrically heated, immersed-electrode type furnaces.

Though all salts are good insulators in the solid state, they become fairly good conductors when melted. This electrical characteristic is utilized in the operating principle of the electrode-type furnace. Ordinary shop voltage, such as 220 or 440 v., from our alternating current source, is reduced to a low voltage (5 to 25 v.), by means of a transformer adjacent to the furnace. This low voltage is impressed on the electrodes immersed in the salt bath, causing an alternating current of rather high amperage to flow through the liquid salt. The salt is heated by its own resistance to the flow.

Ceramic pots are today giving very long low-cost life, when properly sealed, in regular production operations. Mr. Rosseau pointed out that submerged-electrode construction has the desirable feature of no shore-line erosion, as is common to electrodes introduced through the surface of the molten bath. He introduced slides showing that very large installations are in use, both in size of opening and depth of bath. Auxiliary equipment, such as screw conveyors, carrousel and so-called jack rabbit-type mechanisms are easily adapted to use with salt furnaces to permit semi-automatic or automatic operation.

Salt bath furnaces are being used to case harden, quench, temper, braze and descale metals in many special applications leading to the widespread use of this fast method of heating.—**Reported by J. G. Frantzreb for Peoria Chapter.**

Inland Empire Hears Finishing Talk

Gerald H. Kissin (Left), Kaiser Aluminum and Chemical Corp., Discussed "Current Practice in the Finishing of Aluminum" at a Meeting Held by the Inland Empire Chapter. Dr. Kissin, who is head of Kaiser's finishing and electrochemical applications section, is shown with Amon L. Groves (center), vice-chairman, and W. Z. Davis. (Reported by H. Goerig)

Special Agent Describes Functions of F.B.I. at Calumet Chapter Meeting

Speaker: H. W. McClugage
Federal Bureau of Investigation

Calumet Chapter, at its annual Ladies Night Meeting, heard Harry W. McClugage, special agent, Federal Bureau of Investigation, discuss the "Work of the F.B.I."

The Bureau, founded in 1924 by J. Edgar Hoover, is the only investigative agency for the federal Justice Department. Besides the directing staff in Washington, D. C., and the field and resident agent offices, the Bureau has a central identification division and laboratory, both in Washington.

The identification division is mainly concerned with fingerprint identification. It maintains the central files for the nation, having 130 million cards on some 70 million people (one card for each hand), 26 million of whom have been involved in criminal cases. It gives identification service to all local law enforcement agencies, as well as Bureau agents, and these local constabularies send duplicates of their fingerprint cards to Washington for permanent filing. Mr. McClugage gave several examples of how this service functions.

The laboratory division concerns itself mainly with analysis of clues and evidence as an aid in the solution and prosecution of cases by either F.B.I. agents or local authorities. It is divided into several groups, each one specializing in the analysis of certain types of evidence, such as handwriting, or hairs and fibers. Mr. McClugage described some interesting cases which were broken by analysis of evidence by the laboratory division.

Federal agents are limited by law in the scope of their activity, but still cover 140 different classifications of investigations, most of which are criminal. The activities dealing with national security are, of course, classified material, but Mr. McClugage was able to discuss a great many cases of criminal investigations.—**Reported by T. A. Foss for Calumet Chapter.**

New Films

Production Band Machining
Production Tooling

Two new films on band machining, produced by the Do-All Co.'s research laboratory, which reveal the latest techniques and machines for production band machining of metals, including slotting, notching, beveling, slitting, stock cutting and contour cutting. Requests for one or both of these 16-mm. color films should be made directly through the Do-All Co., Des Plaines, Ill.

Glass and You

A color documentary film tracing the history of glass from its beginnings 75,000 years ago as molten, volcanic matter, is being made available by the Corning Glass Works through the libraries of Association Films, Inc., 347 Madison Ave., New York 17, N. Y. The film shows the contributions glass has made to art, science, industry and to many world civilizations.

Present Student A.S.M. Science Award

Cletus Land, Sophomore at the University of Arizona, Was Recently Presented an A.S.M. Science Achievement Award. Pictured during the presentation are, from left: John B. Cunningham, professor of metallurgy; Mr. Land; David S. McLellan, Phoenix Area Chapter Chairman; and T. G. Chapman, dean of College of Mines. (Reported by E. J. Schwetz for Phoenix)

Canadian Progress in Metallurgy Outlined

Speaker: John Convey
Dept. of Mines and Technical Surveys

The second meeting of the recently formed **Quebec Chapter** featured a talk by John Convey, director of the Mines Branch, Department of Mines and Technical Surveys, on "Recent Metallurgical Developments in Canada".

Dr. Convey described the impetus given to metallurgy in Canada during the last war when the country was faced with the necessity of solving its own metallurgical problems. Emphasis was on teamwork, with close liaison between government laboratories and industry, as far as major projects were concerned, as exemplified by the development of the titanium industry.

In recent years, the scientific prospector, often backed by an established mining company and looking for a specific type of ore deposit, has emerged in Canada. While advances in extraction methods have made possible the use of ores and tailings heretofore considered useless, vast rich areas of Canada still remain unsurveyed.

Dr. Convey mentioned the major undertakings at Kitimat, Knob Lake and Steel Rock, and stated that the latter project involved the draining of a lake and removal of a volume of sludge equivalent to the earth moved in construction of the Panama Canal.

In titanium production, Canada will play an increasingly important part in the future. The process worked out at Shawinigan should materially reduce the cost of sponge. Dr. Convey outlined the practical problems in processing titanium and its alloys, and stressed the part Atlas Steels Ltd. has played in the rolling and forging of this metal. He noted the increasingly important role titanium will play in the development of aircraft capable of greater and greater speeds.

The speaker described the complex metallurgical problems involved in the production of atomic energy which Canadian knowledge and experience are helping to solve.

He stressed the need for more Canadian metallurgical research laboratories, but stated that a good start has been made and it could be safely said that, metallurgically, Canada has come of age.—**Reported by J. E. Chard for Quebec.**

$ spends $44.50 to service each member of the Society for a period of one year.

Tri-City Completes Educational Course

Shown, From Left, Are: J. Graham, International Harvester Co., Who Presented a Lecture on "What Heat Treatment Accomplishes in Steel" as One of an Educational Series on "Choosing the Right Steel" Given by the Tri-City Chapter; R. Miclot, Educational Committee; and Chairman V. H. Vieths

The **Tri-City Chapter** has recently completed its annual educational course. The topic for 1955 was "Choosing the Right Steel". Educational course committee co-chairmen, Richard B. Miclot and Ralph F. Moon, selected a group of capable leaders in the field of steel metallurgy to present the coordinated series.

Highlighting the first meeting, covering "Basic Ferrous Metallurgy" were two A.S.M. films, "Iron-Carbon Alloys" and the "Heat Treatment of Steel". After the films, a panel discussion, led by James C. Erickson, divisional superintendent, John Deere Plow Works, and Raymond H. Sholtz, chief metallurgist, Rock Island Arsenal, discussed subjects shown in the films and answered questions. Of particular interest to the group was the discussion of the iron-carbon constitution diagram and its role in ferrous metallurgy.

The second lecture on "Steels as Purchased" was given by Clayton E. Ebert, service metallurgist, carbon bar and semifinished materials, United States Steel Corp. Mr. Ebert described the classification of carbon steels by melt practice; rolling practice as related to physical properties and end use; rolling tolerances and design; influence of composition and melt practice on physical properties; composition as related to machinability; and the most available carbon steel grades.

The third lecture, "What Heat Treatment Accomplishes in Steel," was given by John D. Graham, chief engineer, materials engineering and engineering standards, International Harvester Co. He reviewed the basic transformations that occur in the heat treatment of steel and described in detail how physical properties are affected by heat treatment, and pointed out the significance of these physical properties and how they should be used by product designers.

The final lecture, "Role of Alloys in Steel Selection", was presented by Richard D. Chapman, supervisor of metallurgical research, Engineering Division, Chrysler Corp. Mr. Chapman discussed the factors to be considered when selecting a steel to be used for a new part, or when considering any substitution of alloy steels. He pointed out that steel selection must be considered very carefully in high-production parts, since overspecifying can sometimes become very expensive. Among developments which have made steel selection more scientific and which have replaced former trial and error methods are hardenability tests, fatigue tests and more advanced heat treat equipment and methods. Mr. Chapman stressed the fact that if an alloy steel is necessary for a part, the cheapest and lowest alloy steel which will make a satisfactory part should be selected.

Attendance at the four meetings was excellent, ranging from 111 to 136 persons. Evidence of the general interest in this community in the topic "Choosing the Right Steel" is the fact that 72% of those registered were not A.S.M. members. As a result of this educational course, 14 new members have been added to the roster of the Tri-City Chapter and many more have expressed interest in joining.—**Reported by P. N. Walseth for Tri-City Chapter.**

Explains Problems of Ship Plate Welding

D. K. Ela, Armed Forces Special Weapons Project, Spoke on "Welding of Alloy Steels and Aluminum Alloys" at a Meeting in Albuquerque. From left are: J. L. Abbott, Sandia Corp., chairman; Cdr. Ela; Lcdr, G. A. Keller, A. F. S. W. P.; and Keith E. Mead, Sandia Corp., vice-chairman

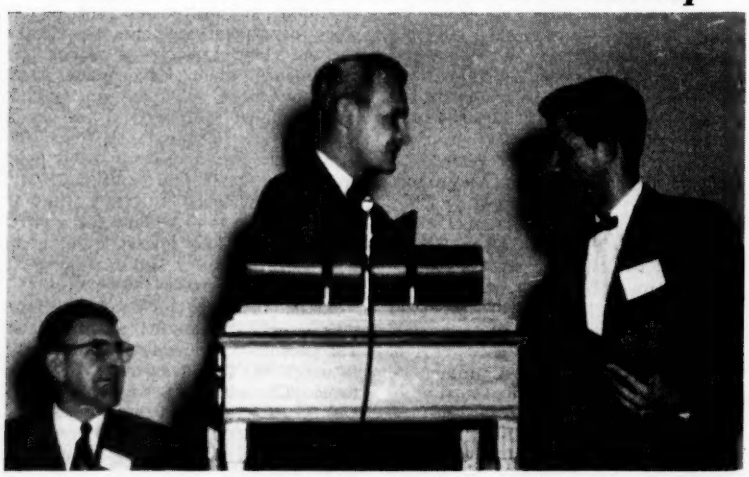
Speaker: D. K. Ela
U. S. Navy

The **Albuquerque Chapter** heard D. K. Ela, deputy chief, Development Division, Field Command, Armed Forces Special Weapons Project, discuss "Welding of Alloy Steels and Aluminum Alloys".

Commander Ela described the problems of welding special alloy steel protective plate and the developments in low-hydrogen electrodes and their application. The problems of high-transition temperature ship plate resulting in failures of the Liberty ships operating at low temperatures were discussed in relation to chemical analysis and deoxidation practices. The solution to the problem by adjustment of the carbon-manganese ratio, by normalizing and by aluminum killing practices was a major achievement in shipbuilding.

The application of welded aluminum instead of conventional steel construction has permitted an increase in the plane capacity of aircraft carrier elevators to nearly three times that previously attained. Automatic welding practices, coupled with precision fit-up, allow welding of the very large structures involved within tolerances of 0.3%. The application of welded aluminum alloy permits faster welding, easier handling and will, after the initial project, decrease the total cost of construction. Use of the newly accepted solid solution alloys will result in greatly increased ductility in the weld zone, permitting design with greater flexibility and increased safety factors and greatly increased emergency capacities.—**Reported by J. L. Abbott for Albuquerque.**

Student Awarded Purdue Scholarship



Glenn A. Fritzlen, Chairman of the Purdue Chapter, Is Shown Presenting the Chapter's Scholarship Award to Leroy Duffner, Student at Purdue University. Present were, from left: Prof. H. T. Amrine, Mr. Fritzlen and Mr. Duffner

Explains Powdered Metal Parts, Self-Lubricating Bearings at Cedar Rapids

Speaker: D. B. Martin
Amplex Div., Chrysler Corp.

D. B. Martin, vice-president in charge of sales for the Amplex Division of the Chrysler Corp., spoke on "Self-Lubricating Bearings and Powdered Metal Parts" at a meeting of the **Cedar Rapids Chapter.** The talk was opened by a sound slide-film which explained how Chrysler Corp. became interested in the powdered metal field because of the need for a dependable clutch pilot bushing. The film illustrated some of the history of powdered metals, beginning with the ancient Egyptians, and showed what powdered metals are and how they are fabricated into usable parts. Several uses of powdered metal parts were shown and the advantages of powdered metal over other methods of fabrication were explained.

Mr. Martin amplified many of the statements made in the film by explaining how powdered metal parts are fabricated, first by mixing pure powdered metals of size, shape and analysis determined by the finished part desired. These mixed powders are then briquetted in dies which impart the desired form by compressing them cold to approximately one-third the volume of the powder, using pressures ranging from 15 to 20 tons per sq. in. Briquetted parts are sintered in controlled atmosphere furnaces bringing about the alloying of the metals in the powders and fusing the powder particles together. Sintered parts are sized in a press to hold very close dimensional tolerances and then, if it is required, are impregnated with oil, where they absorb about 25% of their total volume in oil. This is done merely by immersion in an oil bath. The final step in production is inspection.

The approximate size range of powdered metal parts is from 10,000 per lb. to 250 lb. each. The advantages given for powdered metal parts were that often intricate parts can be produced more cheaply and that powdered metal will serve well in places where no other known substance can be used satisfactorily.

Mr. Martin also discussed the machining, electroplating and carburizing of powdered metal parts and the production of metal powders by electrolysis or atomization. — **Reported by Elmer M. Bruce for Cedar Rapids.**

ASM presents an annual metallographic exhibit held during the National Metal Exposition and gives awards for the best work.

Talks on Nuclear Reactor Metallurgy

Rome Members Heard D. W. White, Jr., Knolls Atomic Power Laboratory, Speak on "Metallurgy for Nuclear Reactors". Shown are, from left: D. W. White, Sr., industrial arts instructor, Laurel St. School; M. F. Howard, chairman; Mr. White; and G. W. Pirk. (Photo by Rome Daily Sentinel)

Speaker: D. W. White, Jr.
Knolls Atomic Power Laboratory

Nuclear energy as a fuel source for power generation has created many new and unusual problems in the field of metallurgy, according to a statement made by Donald W. White Jr., supervisor, materials and processes, Knolls Atomic Power Laboratory, General Electric Co., who spoke on "Metallurgy for Nuclear Reactors" at a meeting in **Rome.**

The speaker gave particular emphasis to the properties of uranium, zirconium, beryllium, vanadium and other metals of nuclear interest and to the techniques involved in their preparation and fabrication. The use of these metals as other than alloy agents has been greatly increased due to advances in the nuclear energy program, he said.

High-temperature and radiation effects on materials greatly influence the selection and treatment of metals which can be safely used.

The need for a failure-proof reactor is doubly important inasmuch as repairs can seldom be made once a reactor has been placed in service.

Two films, "The Atom Goes to Sea" and "A Is for Atom" were shown. The speaker's father, Donald W. White, Sr., industrial arts instructor at Laurel St. School, was also a guest at the meeting.—**Reported by John M. Thompson for Rome Chapter.**

Roberts Made Honorary Kentucky Colonel

Presenting a Kentucky Colonel's Commission to A.S.M. President George A. Roberts (Center) at a Meeting Held by Louisville Chapter Is Harry D. Bitner, Chapter Chairman (Left); and Carl L. Owen, Jr., Vice-Chairman (Right)

Six New England Chapters Schedule Regional Meeting

The New England Regional Meeting, sponsored by the Boston, Hartford, New Haven, Rhode Island, Springfield and Worcester Chapters, will be held in Worcester on Friday, May 13, at the Hotel Bancroft. A complete program of technical papers, plant visits and interesting exhibits has been arranged for visitors from the six New England Chapters, and a program of visits and meetings has been set up for the ladies in the group.

The program for the all-day meeting will include the following activities:

8:00 a.m.—Registration in main lobby, Hotel Bancroft.

9:30 a.m.—Buses leave for visits to: Wyman-Gordon Co., North Grafton aircraft forging plant; or Norton Co., new machine division plant. Ladies' bus will leave for a visit to historic Old Sturbridge Village.

12:30 p.m.—Dutch Treat luncheons at: Wyman-Gordon Co., Norton Co., and Old Sturbridge Village.

3:00 p.m.—Technical sessions in the Baroque Room, Hotel Bancroft, including "Recent Developments in Aircraft Forgings", by G. W. Pappen, production manager, Lockheed Aircraft Corp.; and "Machining and Forming of Modern Materials", by E. J. Tangerman, executive editor of *American Machinist.*

5:00 p.m.—Dutch Treat cocktail and social hour, foyer, Main Ballroom, Hotel Bancroft.

6:30 p.m.—Banquet in Main Ballroom, Hotel Bancroft.

Advance reservations will be necessary for plant visit and banquet activities. For plant visits, certification of United States citizenship by means of the advance registration card must be made and should be in the hands of the reservation committee by May 2. Hotel reservations should be made directly with the hotel. Registration fee for the day's activities, including transportation, will be $2.50 per person, and banquet tickets for members and guests will be $5 each, including tax and gratuities. Banquet reservations must be made in advance and accompanied by payment, with choice of roast beef or lobster dinner indicated on the request.

Joseph C. Danec, Worcester Chapter chairman, is the general chairman for the Regional Meeting. Reservation cards and checks should be mailed to: R. N. S. Meritt, Jr., Olson Manufacturing Co., 100 Prescott St., Worcester, Mass.

ASM has an annual budget in excess of one million dollars.

Gives Explanation of Vacuum Melting

J. D. Nisbet, Director of Research and Development, Universal-Cyclops Steel Corp., Spoke on "Vacuum Melting" at a Meeting in Philadelphia. Shown are, from left: C. Reimer, Mr. Nisbet, R. Leiter and John Clark

Speaker: James D. Nisbet
Universal-Cyclops Steel Corp.

The **Philadelphia Chapter** heard James D. Nisbet, director of research and development, Universal-Cyclops Steel Corp., speak on "Vacuum Melting" at a recent meeting.

Reproducibility and cleanliness are the important reasons for using the vacuum melting process. There are four methods of vacuum melting; namely, induction furnace, vacuum arc, levitation and zone melting. The speaker explained each method and pointed out that the highest degree of purity is obtained by the zone melting process, next being levitation, followed by vacuum arc and induction furnace, respectively.

Vacuum melting finds its greatest application in melting high-purity elements, soft magnetic materials, super alloys and nuclear materials. It is also being used for melting metals for room-temperature applications where fatigue is a problem.

Mr. Nisbet showed slides of some furnaces now in use and explained their operation. Actual cost of producing vacuum melted metal is not known. However, it is conceivable that there may be some saving in labor cost since everything is done by motors and mechanical means and is controlled by an operator outside of the tank.

The largest furnaces today are of about 1000-lb. capacity. Within the next few years, furnaces of 10,000-lb. capacity must be built to meet demands for vacuum melted metals.—**Reported by Frank R. Romeo for Philadelphia Chapter.**

Talks on Radio-Isotopes in Metallurgy

"Applications of Radio-Isotopes to Metallurgy" Were Given in a Talk by Laurence S. Foster, Watertown Arsenal Laboratory, Before a New Haven Chapter Meeting. Shown are, from left: Ralph E. Keirstead, science consultant, Connecticut Department of Education; Maur J. Weldon, vice-chairman; Dr. Foster; and Lloyd E. Raymond, technical chairman of the meeting

Speaker: Laurence S. Foster
Watertown Arsenal Laboratory

Laurence S. Foster, chief, nucleonics branch, Watertown Arsenal Laboratory, discussed the "Applications of Radio-Isotopes to Metallurgy" at a meeting held by the **New Haven Chapter.**

To introduce the subject, Dr. Foster demonstrated radioactivity of his wrist watch and of orange-glazed ceramic pieces, using a Geiger-Mueller counter. The orange glaze contained uranium and its production was the major use of uranium prior to 1942. As a result of the discovery of the neutron in 1932, and of artificial radioactivity by the Joliot-Curie's in 1934, and particularly because of the invention of the cyclotron and the modern nuclear reactor with its large neutron flux, there are radio-isotopes available which may be used to "tag" almost all of the chemical elements and, by means of their radioactivities, to trace them through chemical and metallurgical processes. They may be used to follow metal-slag reactions, to test the wear of tungsten carbide tool tips, to measure the wear of bearings, to trace electroplating of metals under various conditions, to check the mechanism of corrosion, and to provide accurate chemical analyses of contaminations that are to small to be determined in any other manner.

To illustrate activation analysis, Dr. Foster reported in detail the method used at Alcoa Research Laboratories to determine traces of phosphorus in very pure aluminum, taking advantage of the activation facilities of the Clinton pile at Oak Ridge National Laboratory. Accurate checks were obtained when the phosphorus content was as low as 50 parts per million.

Physical metallurgy has come to depend upon the micro-examination of polished and etched specimens to identify phases and microconstituents. To date, radio-isotopes have contributed little to physical metallurgy except in the study of self diffusion, where they present obvious advantages. The difficulty has been the lack of resolutions higher than 10 to 50 diam. Recent improvements in autoradiographic emulsions have permitted magnifications to 1500 diam. under favorable circumstances.

Dr. Foster reported on work sponsored by the Ordnance Corps at the University of Michigan in which H. J. Gomber and M. J. Sinnott and their students have produced autoradiographs at 500X and 1000X. Similar work has been carried out by M. Bever and his students at Massachusetts Institute of Technology. Systems examined by this new tool include diffusion of bismuth and nickel into both polycrystalline copper and copper bicrystals. The conditions under which grain boundary diffusion occurs were revealed. Diffusion of radioactive nickel into gamma and into alpha iron revealed that grain boundary diffusion predominates. The segregation of radioactive sulphur in iron into globular inclusions by addition of manganese was visually evident. The fate of radioactively tagged grains of a metal during cold working was revealed. The precipitation of Fe_3C from ferrite was demonstrated by use of C-14.

Now that these techniques have been worked out and reported in the literature, it is expected that high-resolution autoradiography will be accepted as a standard metallurgical technique.—**Reported by F. E. Storm for New Haven.**

Cites Role of Metals In Auto Industry

Speaker: Joseph Gurski

Ford Motor Co.

Joseph Gurski, materials and process section, manufacturing research department, Ford Motor Co., spoke on "Nonferrous Metals in the Automotive Industry" at a meeting held by the **Purdue Chapter.**

The modern automobile is composed of approximately 65% wrought ferrous metals, 17% cast ferrous metals, 14% nonmetals and 4% nonferrous metals. Nonferrous metals are used because of their unique physical properties, especially thermal and electrical conductivities, specific gravity, corrosion resistance and appearance.

Copper, with its family of brasses and bronzes, is the predominating nonferrous metal used in the automotive industry. The formability, solderability, machinability and corrosion resistance of copper, brasses and bronzes place them in a preferred position. One outstanding application is the radiator. Some experimental work has been done to substitute aluminum in radiator manufacture. However, joining problems prohibit the use of aluminum for the time being, although it is less expensive and less strategic. Existing air conditioning units in automobiles also use a considerable amount of copper.

Wrought aluminum has the advantages of low specific gravity, good appearance, easy formability and lower price (by volume) than copper. However, it is difficult to join and some corrosion problems exist, especially near the battery. Aluminum wire in generator field coils and battery cables has been used successfully. In buses, trucks and other vehicles where the pay load is important, aluminum extrusions or sheet can economically replace steel, even though initial costs are higher. Styling requirements could dictate the use of aluminum where appearance is important.

Lead and tin are used in solder and dip coating applications, with about 11 lb. of solder used per car. From 25 to 30 lb. of lead is used in batteries. Some cadmium nickel batteries are in use; however, they are expensive and economical only in special cases. About 20 lb. of aluminum die castings is used in each automatic transmission.

Of the total die castings produced annually, about 50% are used in the automotive industry. The outstanding characteristic of each die cast metal is as follows: Zinc—excellent plating; magnesium—lightest weight; aluminum — intermediate strength, good casting properties.

When a choice is possible, the current market price determines the choice, since the prices of these metals fluctuate constantly.

Chromium plating is used on grills and bumpers. The steel grills and bumpers are plated with copper and/or nickel, then finally, chromium. Steel gives strength, copper and/or nickel furnish corrosion resistance and chromium prevents tarnish. The war-time reduced quality of surface protection was due principally to the shortage of nickel.

Many developments in automotive manufacture vary the ratios of nonferrous metals to each other, but the 4% nonferrous metals of the total automobile weight has remained fairly constant. The addition of air conditioning, automatic transmissions and other new products will tend to result in a steady increase in the use of nonferrous metals and may even increase the 4% figure.—**Reported by Joseph J. Phillips for the Purdue Chapter.**

Outlines Developments in Toolsteels

Shown During a Recent Meeting of the Western Ontario Chapter at Which B. M. Hamilton, Atlas Steels Ltd., Presented a Talk Entitled "Developments in Toolsteels" Are, From Left: Frank Miller, vice-chairman; R. E. Barton, treasurer; C. G. Robinson, membership chairman; Mr. Hamilton; I. S. Reid; and Jack N. Walton, technical chairman of the meeting

Speaker: B. M. Hamilton

Atlas Steels Ltd.

"Developments in Toolsteels" was the subject of a talk given by B. M. Hamilton, assistant manager, market and production development, Atlas Steels Ltd., at a meeting of the **Western Ontario Chapter.**

Mr. Hamilton described the initial developments of the plain carbon toolsteels in which the carbon content ranges from 0.70 to 1.50%. This spread in composition provides the necessary wear-toughness ratio for the entire field of toolsteel applications, from rivet sets and chisels, to wire drawing dies and engraving tools.

It was at the turn of the last century that alloyed toolsteels made their appearance in the field of die applications. The manganese nondeforming steel, the high-carbon, high-chromium toolsteel and the tungsten chisel steel were among the first alloyed toolsteels to gain commercial acceptance. Following the first World War, increased intricacy in die design and demand for better size control and safety in hardening promoted the introduction of air hardening toolsteels. Mr. Hamilton pointed out how the various alloyed oil and air hardening toolsteels could also be classified according to their wear-toughness ratio as were the original plain carbon toolsteels, so simplifying the approach to grade selection.

The effect of alloy additions on steel was explained with the aid of slides which showed their tendency to either dissolve in the iron or join with carbide to enhance some particular property of the steel.

Mr. Hamilton then explained the development and application of hot work toolsteels. While the low-carbon chromium-molybdenum and the tungsten-chromium grades have found most general acceptance over the past decade, it was pointed out that the ever-increasing demands on hot forging and forming tools, particularly with the new highly alloyed aircraft materials, are drawing attention to the newer super-alloyed, hot work toolsteels which provide high resistance to red wear or abrasion. Mention was also made of the precipitation hardening hot work grades.

In the field of high speed steels, Mr. Hamilton discussed the increasing application of the high-carbon high speed steels. The sulphurized high speed grades were also said to be a growing interest due to their ability to provide improvement in machinability at no apparent sacrifice in performance.—**Reported by Jack N. Walton for the Western Ontario Chapter.**

The Inside Story of A. S. M.

A. S. M. leadership in many fields stems from its willingness to do something about a situation—to do more than talk—or to consider, with good intent, answers to a problem. In the area of leading youngsters into an interest in all things scientific . . . thence into a specific interest in metals, A. S. M. has for some years devoted much time and effort, money and manpower. This effort is bearing results—it is beginning to "pay-off" in a definitely growing trend among junior and high-school students toward metals engineering as a career goal.

Under the wing of the Advisory Committee on Metallurgical Education, the A.S.M. Science Achievement Awards have made themselves felt in many a metropolitan high school, in many a whistle-stop junior-high school.

Through the cooperation and detail handling of the National Science Teachers Association, real progress is being made in turning the attention of youngsters toward the fascinating fields of physical and natural sciences. This is especially true in the 7th to 9th grades, where eager young minds seek the new, the unusual, the different.

Senior-high school entries are required to have some relationship or treatment involving metals or their application.

The National Science Teachers Association does the actual job of informing the youngsters about the awards, the rules and regulations, the subject areas available to the entrants. What makes this angle so warmly human is the simple fact that in almost every class in almost every school there is one outstanding youngster with a more inquisitive mind—a more questing, searching hunger for information than his fellows—and his teacher naturally urges and aids and directs that spark of scientific fire. The results are heartening and carry great promise.

N.S.T.A. appoints a district judge and to him come all entries for screening. The qualified entries are sent along by the district judge to a central committee at N.S.T.A. headquarters, where judging is completed.

It would astonish many a chairman of the board of many a major firm to check into what these youngsters come up with in their ventures into scientific fields. Some of the projects are downright brilliant, most of them make superb good sense and now and then one shows up that sets off a chain-reaction of activity winding up with a brand-new slant on production by the metals industries.

The N.S.T.A. central committee announces the awards and A.S.M. provides the machinery for publicizing the award winner and his teacher at the "home town" and regional levels. The 11th and 12th grade winners earn cash awards and the honorable-mention winners get appropriate recognition for their efforts. Lower grades earn U. S. bonds in lieu of cash payments and honorable-mention certificates.

All of which should provide a pretty good idea for industry—the metals industries folks, in particular. Here's an effort that's constant, that goes on year after year—and brings to light the outstanding inventiveness . . . ingenuity and basic talents of hundreds of bright and imaginative American youngsters.

So what happens to them? Does industry, recognizing its need for this very kind of talent—developed and trained and sharpened over the necessary years in our better technical universities and colleges, make a move to help insure the continuation of these lads in the metals fields?

If not—why not? It would seem this special A.S.M. project would be a natural—and highly productive—source of the special kind of mind and nature the metals industries must attract to grow—to remain flexible and alert—to stay in its proper sphere as one of the nation's more important economic factors.

Best medicine we could think of, at the moment, for tired executives, might be in teaming up with one or more of these promising youngsters and making sure that they are not lured into one of the more appealing areas of engineering, of science and inventiveness. **C.S.**

Points Out Problems In Atomic Energy Field

Speaker: C. Roger Sutton
Argonne National Laboratory

C. Roger Sutton, senior metallurgist, Argonne National Laboratory, presented a discussion on "Atomic Energy and Metallurgy" at a meeting of the **St. Louis Chapter.**

Mr. Sutton first showed a film, "Atom Goes to Sea", which dealt with the two atomic submarines, the Nautilus and the Sea Wolf. He then covered the special problems which metallurgists and materials engineers face in the atomic energy field. These problems are a result of special physics considerations and environmental conditions whereby the usual, normal problems of materials selection and fabrication are considerably complicated.—**Reported by William M. Holtgrieve for the St. Louis Chapter.**

Sets Up Geisler Memorial

The **Eastern Ney York Chapter** is setting up an annual award as a memorial to the late Alfred H. Geisler to recognize outstanding contributions to the metallurgical profession. The award is to be administered by the Chapter chairman with the advice of the executive committee and is restricted to candidates under 35 years of age. Nominations shall be made on the basis of outstanding contributions to the profession in the fields of education, research, manufacturing and distribution.

The award shall consist of a suitable engraved certificate bearing the name of the recipient and the year of the award and be presented at the annual meeting of the Chapter.

Roberts at Detroit's Officers Night

George A. Roberts, National President, Presented a Talk on "Powder Metallurgy of Alloy Steels" at the National Officers Night Meeting Held by the Detroit Chapter. Shown, from left, are: Edward Dofter, Kenneth Packer, Donald Henry, Dr. Roberts, and Past-President Walter E. Jominy

Describes Development Engineering

Shown at a Meeting of the Springfield Chapter Are, From Left, Chairman Ridgway A. Cook, Vanadium-Alloys Steel Co.; George H. Hupman, General Electric Co., Who Spoke on "Development Engineering"; and William H. Weaver, University of Massachusetts, Technical Chairman of the Meeting

Speaker: George H. Hupman
General Electric Co.

Speaking before the Springfield Chapter, George H. Hupman, consultant in the general engineering laboratory, General Electric Co., described industrial organization for technical work in a talk on "Development Engineering". Mr. Hupman's talk was based on the results of a study made recently by a team of employees who investigated the ways in which technical work was being accomplished by the General Electric Co.

Mr. Hupman explained the relationship of technical work to the other functions of a business enterprise. He pointed out that decisions of what not to include in engineering and research as well as what to include must be made.

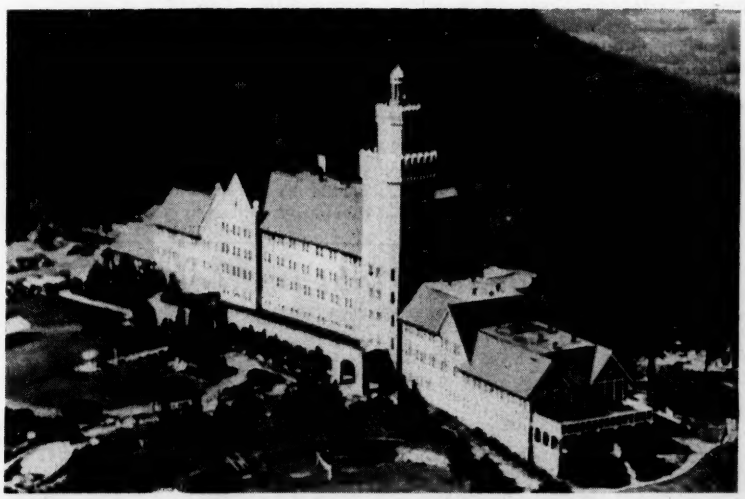
Differentiating between engineering and research, Mr. Hupman stated that research is concerned with obtaining understanding and knowledge, whereas engineering is the application of understanding and knowledge and of the industrial arts to the creation of useful products and to telling others how to produce these products. Engineering work must also prove the technical feasibility of new and improved products.

Research work was further subdivided into basic research, which aims at achieving an understanding of nature, and applied research, which aims at acquiring knowledge of materials. Engineering work, Mr. Hupman stated, consists of two major branches: advanced engineering and design engineering. Advanced engineering seeks to prove the feasibility of proposed products; design engineering is concerned with product design, equipment design, layout, etc. These subdivisions of research and engineering should not duplicate the work of each other, but at the same time they should be in good communication with each other to insure mutual stimulation and interchange of information.

Mr. Hupman also outlined the general mode of attack to be followed in solving problems. The problem must first be visualized, studied and clearly defined. A solution is then conceived, investigated and specified. Beyond this, Mr. Hupman said, the solution must be developed and refined, evaluated and finally demonstrated. There then remains the final design step, final proof of the completed design and delineation of the solution to the problem. Persons suitable for one of these steps may not be equally suitable for other steps. Hence, great care must be exercised in the assignment of personnel to the solutions of various phases of problems.—**Reported by Carl A. Keyser for Springfield.**

publishes annually, photographs and biographies of all graduating student members and distributes this information to some 22,000 possible employers.

Site of Southern Metals Conference



Plans for the Southern Metals Conference, sponsored by the six southern Chapters of A.S.M., to be held at Lookout Mountain Hotel, Chattanooga, Tenn., June 1 through June 3, 1955, are rapidly taking form, not only along business and meeting lines, but also along entertainment lines.

The hotel, located 2400 ft. above sea level, affords a breath-taking view of seven states. Features include a swimming pool, dancing under the stars, archery, putting green and nearby golf courses. Reservations, which are now coming in rapidly, should be forwarded as soon as possible to: Walter A. Neisz, 3606 Wimberly Lane, Chattanooga 11, Tenn., or Ab Flowers, 3130 Navajo Drive, Chattanooga, Tenn. Rates are $10 per day per person, which includes meals. Children in rooms with parents are free, with meals at $3.50 per day for children under 12 and $6.50 per day for those over 12.

Registration fee for the Conference will be $7.50 for the men and $5.00 for women. Checks should be made payable to the Southern Metals Conference.

The program for the Conference has been planned so that, along with the technical talks and plant trips, members will also enjoy the lovely surroundings in the area. A Tennessee fish fry on the patio of the hotel has been planned, as well as a banquet, to be followed by a dance.

Discusses Welding of Stainless Steel

At a Joint Meeting Held by the Chattanooga Chapters of the American Society for Metals and the American Welding Society, Harry Reid, Jr., Talked on "Welding of Stainless Steel". Shown are, from left: Ab Flowers, A. S. M. chairman; Mr. Reid; Robert Gee; and Roy Mitcham, A. W. S. chairman. (Photo by W. L. Dearing, Chattanooga Chapter Photographer)

Speaker: Harry F. Reid, Jr.
McKay Co.

The **Chattanooga Chapter** held a joint meeting with the Chattanooga Chapter of the American Welding Society during which Harry F. Reid, Jr., manager of the technical service division, McKay Co., spoke on the "Welding of Stainless Steels".

Using slides to outline and illustrate his talk, Mr. Reid gave the three general divisions of stainless steel: Martensitic—low carbon, with 11 to 18% chromium; ferritic—higher carbon and 16 to 30% chromium; and austenitic, with low carbon, and 14 to 30% chromium and 6 to 36% nickel. Since stainless steels generally have higher resistance to electricity than carbon steels and a thermal conductivity of about one-half that of carbon steel, stainless steel rods tend to get much hotter than mild steel rods and less current must be used to weld them. This is especially important in the control of distortion and warpage which stainless is subject to. The use of lower current, smaller beads and lower interpass temperatures helps control heat.

Mr. Reid showed applications of each stainless type with comments on preheat and postheating where necessary. The ferritic and martensitic types require this preheat and postheat for crack prevention and hardness control. Examples of austenitic types were given and the part played by columbium in the prevention of carbide precipitation explained. Using slides to illustrate, Mr. Reid then gave some typical rod coating compositions and explained the flow of materials through a modern coated weld rod manufacturing plant.—**Reported by J. H. McMinn for Chattanooga Chapter.**

At President's Night in Rockford

Shown at the President's Night Meeting Held by the Rockford Chapter Are, From Left: Edgar C. Wallace, Vice-Chairman; National President George A. Roberts; and J. Walker Eaton, Chairman. Dr. Roberts presented a talk on "High Speed Steels". (Reported by Quentin C. Bowen)

Tells How Titanium Is Fabricated and Applied In Aircraft Industries

Speaker: John F. Baisch
Boeing Airplane Co.

John F. Baisch, metallurgist, Boeing Airplane Co., presented an address on "Titanium Fabrication and Applications" at **Puget Sound.**

Mr. Baisch discussed recent improvements in titanium melting techniques and the resulting effect on material uniformity. He noted the establishment of the Titanium Metallurgical Laboratory at Battelle Memorial Institute by the Defense Department Steering Group on titanium research and development. In addition to other functions, the laboratory will collect and disseminate available information and provide technical consulting services.

A welded titanium alloy pressure vessel fabricated at Boeing was used to illustrate some of the problems associated with sheet metal forming, machining and welding. Rem-Cru's A-110AT alloy sheet in the annealed condition was used for all components of the vessel except the flanged fitting. Two hammer-formed hemispherical heads were joined to a cylindrical shell section by welding. A single fitting machined from A-110AT alloy bar stock was welded into one head section. Several stress relieving heat treating cycles were used during fabrication. After 30 cycles of proof pressure loading to 3260 psi., the pressure was increased until the vessel failed. On an equal-weight basis, the performance of this annealed titanium vessel would be comparable to an alloy steel vessel heat treated to 218,000 psi.

Mr. Baisch cited recent experiences with titanium alloy sheet which indicated optimum results were obtained when forming was conducted at elevated temperatures. Forming temperatures depend on the alloy used and degree of deformation required. Stress relief and interpass annealing temperatures are dictated by the alpha-beta transformation range and the gas absorption characteristics of the alloy concerned.

Short-time interpass annealing treatments have been conducted at 1400° F. without serious surface contamination. Thirty-minute exposure of A-110AT alloy sheet at 1400 and at 1600° F. resulted in embrittled oxygen rich layers of 0.0002 and 0.0005 in. thicknesses, respectively.

The use of titanium for mechanical fasteners for aircraft applications is developing rapidly. A critical problem in the production of alloy titanium bolts has been due to the lack of proper temperature control during the head-forming operation. One essential requirement for satisfactory titanium aircraft fasteners will be a dependable supply of structurally uniform rod and wire.—**Reported by William H. Downing for Puget Sound.**

Modern Steelmaking Course Concluded by Hartford

The Hartford Chapter recently concluded a series of three lectures on "Modern Steelmaking". The course included a talk on "Ore and Blast Furnace Operations", by L. W. Butz, Bethlehem Steel Co.; "Bessemer, Openhearth and Electric Furnace Operations", by T. V. Wainwright, Bethlehem Steel Co.; and "Shaping and Rolling of Steel", by G. O. Maish, Bethlehem Steel Co.

Mr. Butz presented an illustrated lecture on the processes and equipment needed to change the raw materials, iron ore, coke and limestone, into metallic iron. He discussed the operation from the entry of the materials into the plant to the tapping of the metal from the furnace.

Mr. Wainwright presented a description of bessemer, openhearth and electric furnace operations and discussed the metallurgical fundamentals and problems involved in these operations. A 30-min. movie of the three steelmaking processes was used to illustrate his talk.

Mr. Maish's illustrated discussion was a review of the conversion of the ingot into various semifinished and finished products by means of rolling and forging processes.

The lectures were held in the Trinity College chemistry auditorium and an attendance of 118 was registered. E. L. Bartholomew, Jr., University of Connecticut, is chairman of the Chapter's educational committee.

Savannah River Speaker Gives Welding Principles

Speaker: F. J. Winsor
duPont Experimental Station

F. J. Winsor, duPont Experimental Station, spoke on the "Principles of Welding" at a meeting of the **Savannah River Chapter.**

Dr. Winsor discussed the scientific factors involved in arc welding. He divided his subject into three parts: Consideration of some of the basic physics of welding arcs; discussion of the welding metallurgy of aluminum alloys; and discussion of the welding metallurgy of austenitic stainless steels.

The speaker indicated that, although much remains to be learned, research is gradually adding to our knowledge of the fundamental factors involved in arc welding. He stated that, in order to keep pace with the progress of welding science, it is necessary to understand and appreciate the fundamental information which is available.

Elementary physics of welding arcs were discussed and major differences between d.c. straight polarity, d.c. reverse polarity and a.c. welding described. The functions of electrode coatings and the forces involved in metal transfer across welding arcs were also discussed.

Properties of aluminum alloys which require consideration in applications of arc welding to these materials were then explained, and differences in the welding of heat treatable and nonheat-treatable aluminum alloys described.

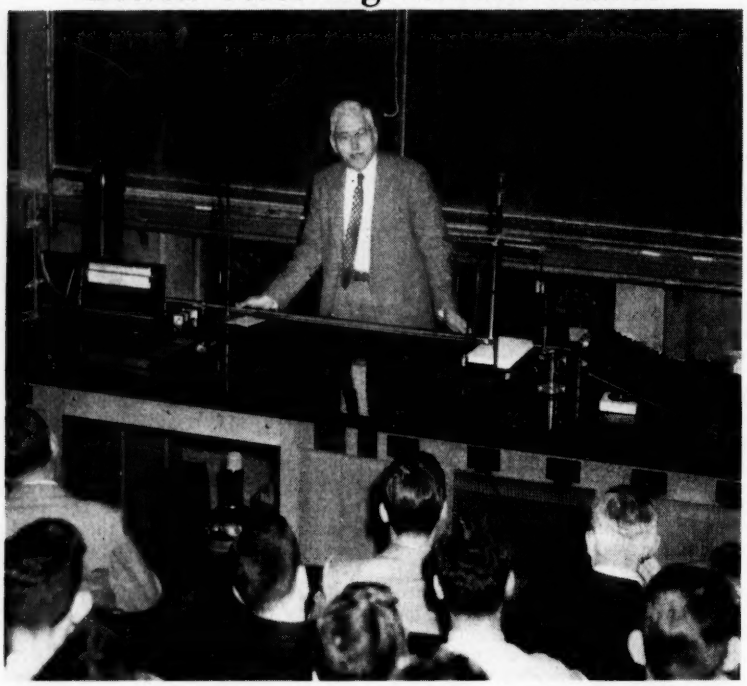
The speaker discussed the factors involved in specifying chemical composition limits for austenitic stainless steel welding filler metals. He discussed carbide precipitation in stainless steel weldments and methods of controlling this phenomenon.

Dr. Winsor concluded by mentioning that in discussions of the progress of welding science, there is often an unfortunate tendency to overlook the important contribution which welding craftsmen have made towards the success of arc welding as a practical joining method. The speaker showed a slide which showed how the piping in a modern chemical plant might look without the benefit of welding.—**Reported by E. A. Wick for Savannah River.**

Full House at Chattanooga's Lecture Series

Part of the Audience of 167 in Attendance at One of the Meetings of the Chattanooga Chapter's Recently Completed Educational Course, Conducted by E. E. Stansbury, Professor of Metallurgical Engineering, University of Tennessee. The following lectures were included: "Structure and Properties of Crystals"; "Iron-Carbon Alloys and Principles of Heat Treatment"; "Mechanical and Thermal Treatment of Steel"; and "Complex Steels and Their Treatment". (Photograph by W. L. Dearing for Chattanooga)

Boston Gives High-School Course



John Chipman, Massachusetts Institute of Technology, Is Shown Making the Welcoming Address to High-School Students and Teachers Who Attended the Series of Four Lectures on Metallurgy Sponsored by the Boston Chapter

The **Boston Chapter** has just concluded an educational lecture series in conjunction with Massachusetts Institute of Technology for the benefit of high-school seniors in the Boston area. The series of four lectures was designed to interest the students in the pursuit of metallurgy as a career.

Response to the course of lectures was outstanding. A total of 250 students from 39 different high schools attended the series with their teachers, and the lectures, illustrated with many demonstrations and table models, were enthusiastically received.

The four lectures, each of two hours duration, included: What Is Metal, by J. T. Norton; How Metals Are Made, by T. B. King; How Metals Are Shaped, by W. A. Backofen; and How Metals Are Used, by N. J. Grant. All the lecturers are professors of metallurgy at M.I.T.—**Reported by M. B. Graham for Boston.**

Presents Fundamentals of Heat Treatment of Steel

Speaker: Peter Payson

Crucible Steel Co. of America

Peter Payson, assistant director of research, Crucible Steel Co. of America, discussed "Fundamental Principles of Heat Treatment" at a recent meeting of the **Puget Sound Chapter.**

Mr. Payson emphasized that the practice of heat treating steel is the same today as it was hundreds of years ago. The primary purpose, as always, has been to provide desired properties which the steel in its particular form does not possess. Improved equipment and greater technical knowledge in the past 30 years have largely eradicated our past ignorance of heat treating principles.

For simplicity and ease in presentation, Mr. Payson based his discussion on three typical steels selected to serve as examples of heat treating combinations: High speed steel of M-2 composition; a 1.05% carbon toolsteel; and a deep hardening chromium-nickel-molybdenum steel of the 4340 type.

Photomicrographs of each steel were presented as the heat treating temperatures were raised from room temperature to 1350, 1450, 1600 and finally up to 2100° F., and to 2250 and 2300° F. for the high speed steel only.

The effect of increasing temperatures on grain growth, dissolving of carbides and the formation of austenite were thoroughly discussed.

Time of cooling and the size of the part being cooled were shown to be very important. Stress was placed on the fact that the type of steel involved determines the necessary cooling rate to insure full hardening. Mr. Payson pointed out that **TTT**-curves are advantageous in determining the cooling rate required for full hardening. Additional information is available on these curves, such as transformation time and hardness of transformation products.

Mr. Payson also discussed martempering and austempering. Martempering is used primarily to minimize residual stresses to prevent distortion or cracking, while austempering is low-temperature isothermal transformation, producing bainite. Austempering requires no further tempering to produce a hard, tough steel.

Mr. Payson concluded his discussion with descriptions of spheroidizing, annealing and tempering operations.—**Reported by L. F. Barber for Puget Sound Chapter.**

Speaks on Materials in the Atomic Age

Members of the Rhode Island Chapter Heard Arthur Matheson, Former Director, Technical Administration Division, Schenectady Operations Office, Atomic Energy Commission, Speak on "Reactor Materials in the Atomic Power Age". Pictured are, from left: Sidney Seigel, technical chairman of the meeting; Dr. Matheson; and James H. Hinman, Chapter chairman. Dr. Matheson is now product manager—atomic energy, Metals and Controls Corp.

Austin Speaks on Magnification in Time

James B. Austin, A.S.M. Past President, Gave a Talk on "Magnification in Time" at a Meeting Held Recently in Rochester. Shown are, from left: Leon C. Kimpal, vice-chairman; Dr. Austin; Gordon B. Cowles, Eastman Kodak Co.; and P. M. Stoehr, Bausch & Lomb Optical Co. (Photo by N. Iannone)

Speaker: James B. Austin

U. S. Steel Corp.

A meeting of the Rochester Chapter held jointly with the Superintendents and Production Supervisors Group of the local Industrial Management Council and the American Foundryman's Society, featured a talk on "Magnification in Time in Metallurgical Operations" by James B. Austin, assistant vice-president—fundamental research, U. S. Steel Corp. and A.S.M. past president.

Dr. Austin reviewed magnification in space wherein, through the use of the electron microscope, magnifications as high as 65,000X have been obtained. At these levels of magnification, care must be given the problem of sampling so a representative picture may be obtained.

Magnification in time (high-speed photography) is a relatively new technique. Advances to date, through the use of a stroboscope, have enabled exposures as small as 1/10,000 sec. With conventional equipment, movies at speeds upwards to 3000 to 7000 frames per sec. can be produced, thereby permitting a slowdown of motion of 3000/16 = 118X to 7000/-16 = 438X. Two basic types of subject are usually involved in time magnification: Incandescent or self-luminous subjects, such as the interior of a blast furnace; and externally lighted subjects, which often necessitate the use of a series of flashes. The sampling problem, to date, in time magnification, concerns itself with the timing of the shooting of the scene in order to reduce to a practical minimum the tremendous footage of film required.

Movies taken at 3000 frames per sec. and projected at 16 frames per sec. were presented. They showed cream poured into coffee, the striking of a safety match, the inside of a blast furnace through a tuyere opening, an openhearth tap, an ore eration, the breaking of tensile and impact test samples, a nail former, boil in the openhearth, a welding op a rivet header, a rolling operation in a 1300-ton press, hot forging and blanking operations in a 400-ton press.

A tool exhibit by the Do-All Co., and the display of prize-winning metallographs from the National Metal Congress were also shown during the meeting.—**Reported by Sydney Gamlen for Rochester.**

Program of Annual Lower Lakes Regional Conference

The Buffalo Chapter was host at the Third Annual Lower Lakes Regional Conference held Apr. 12 and 13 this year. The Conference was sponsored by the Ontario, Syracuse, Rochester, Rome, Southern Tier and Buffalo Chapters.

General Chairman J. L. Lamont announced that the theme of the Conference was "What's New in Metallurgy". The technical program included the following:

TUESDAY, APR. 12

Modern Developments in Steelmaking Practice, which included talks on "Openhearth Practice", by John S. March, Bethlehem Steel Co., "Oxygen Steelmaking in Canada", by J. F. McMulkin, Dominion Foundries & Steel Co., and "Continuous Casting", by W. W. Jacobs, Atlas Steels.

New Metals and Alloys, which included talks on "Titanium and Vanadium", by D. J. McPherson, Armour Research Foundation, "High-Temperature Alloys", by G. A. Fritzlen, Haynes Stellite Co., and "Cermets", by G. Stern, American Electro Metal Corp.

A plant tour through the Motor and Control Division, Westinghouse Electric Corp., was included in the afternoon schedule. Special guests at the dinner meeting were A.S.M. Vice-President A. O. Schaefer and National Trustee Walter Crafts. L. W. Olmstead, Colonel, Corps of Engineers, U. S. Army, spoke on the "St. Lawrence Seaway".

WEDNESDAY, APR. 13

New Concepts of Quality Control, which included talks on "Basic Principles", by E. T. Welmers, Bell Aircraft Corp., "Producer Aspects", by J. Orton, Steel Co. of Canada, and "Consumer Aspects", by R. W. E. Leiter, Budd Manufacturing Co.

New Developments in Heat Treating, which included talks on "Alloy and Ultra-High Strength Steels", by P. Payson, Crucible Steel Co. of America, "Aluminum Alloys", by E. H. Hollingsworth, Aluminum Co. of America, and "Induction Heating", by H. B. Osborn, Jr., Ohio Crankshaft Co., Tocco Division.

A plant tour through Bethlehem Steel Corp. was also included.

Outlines Mineral Resource Progress Made in Canada

Speaker: Dr. John Davis

Dept. of Trade & Commerce

John Davis, associate director, Economics Branch, Department of Trade and Commerce of Canada, presented a talk on "Canada's Mineral Resources" before a meeting of the **Cleveland Chapter.** Dr. Davis has devoted considerable study to the development of primary resources of Canada. In addition to work with federal and provincial government departments and agencies, he has worked closely with trade associations and private firms concerned with the development of mineral properties in Canada.

Dr. Davis' talk included a filmed report on two new Canadian projects which have added significantly to North American industry and are attracting a great deal of attention in this country—the aluminum development at Kitimat in British Columbia and the opening up of the new iron deposits in Quebec-Labrador. Both films showed how the tireless efforts of our Canadian friends and man's ingenuity in combining skill and machines to overcome nature's obstacles were employed in these vast developments of electric power and mineral resources.

The Kitimat project, developed by the Aluminum Co. of Canada, represents an investment of approximately 500-million dollars. Present production of aluminum is about one-fourth of capacity. Expansion of smelting and refining facilities to increase the output is now in progress.

Sixteen Canadian and American firms have invested over one-quarter billion dollars in the development of the Quebec-Labrador project where some 417,000,000 long tons of rich iron ore, containing as high as 60% iron, lie beneath a mere 66-ft. overburden. The yearly output of iron ore from this region is expected to reach 10 million tons by 1960.—**Reported by R. Stoiber for Cleveland.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A General Metallurgical

35-A. Detroit Steel Corporation Completes the Expansion of Its Portsmouth Division. Charles Longenecker and Harry E. Trout. *Blast Furnace and Steel Plant,* v. 43, Feb. 1955, p. 189-216.

Equipment and layout of a modernized steel plant. Photographs, diagrams. (A5, ST)

36-A. Water Processing at Fairless Works. H. S. Spitz. *Iron and Steel Engineer,* v. 32, Jan. 1955, p. 70-77.

Dependable automatic system for supplying large amounts of water required by huge steel works. Diagrams, photographs. (A5, ST)

37-A. Developments in the Iron and Steel Industry During 1954. I. E. Madsen. *Iron and Steel Engineer,* v. 32, Jan. 1955, p. 107-150.

Review of new facilities and processes covering all phases of the industry from ore beneficiation to electrical equipment and materials handling. Photographs, diagrams. (A general, ST)

38-A. "Plancor 422"—a Wartime Steel Plant. M. E. Goetz. *Metal Progress,* v. 67, Feb. 1955, p. 109-115.

Troubles surmounted in design, construction and emergency operation of an integrated plant for making gun steel or aircraft quality steel from molten pig and own scrap, by duplexing openhearth and electric furnaces and rolling large ingots into forging blooms. Photographs. (A5, D general, ST)

39-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 22, Jan. 1955, p. 29-36.

Defines "oxonium" to "patio process". Photograph, tables, diagrams, graphs. (To be continued.) (A10)

40-A. (German.) **Application of the Law of Pulsation to Metallurgical Processes.** Wolfgang Küntscher. *Metallurgie und Giessereitechnik,* v. 4, no. 12, Dec. 1954, p. 533-538.

Experiments on pulsating pressure and suction during the course of combined reactions in metallurgical processes. Diagrams, tables, graphs. 6 ref. (A general)

41-A. Metals—Review and Forecast. Gold. Titanium. Silver. Aluminum. Magnesium. Copper. Zinc. Lead. Uranium. Tin. Mercury. M. A. Kriz, Thomas W. Lippert, Francis H. Wemple, Irving Lipkowitz, J. D. Hanawalt, Hans H. Wanders, Charles R. Ince, Robert L. Ziegfeld, Robert D. Ninginger, George H. Cleaver and Helena M. Meyer. *Engineering and Mining Journal,* v. 156, Feb. 1955, p. 75-95.

Includes tables, graphs. (A4, EG-a)

42-A. Ferroalloy Metals—Review and Forecast. Cobalt. Molybdenum. Chromium. Tungsten. Nickel. Manganese. Norwood B. Melcher, Hubert W. Davis, Robert W. Geehan, Charles Katlin and Gilbert L. DeHuff, Jr. *Engineering and Mining Journal,* v. 156, Feb. 1955, p. 96-101.

Includes tables. (A4, Fe-n)

43-A. Minor Metals—Review and Forecast. Beryllium. Cadmium. Antimony. Arsenic. Bismuth. Platinum. Thorium. Rare Earth Metals. Selenium. Charles White Merrill, Horace T. Reno, Robert L. Mentch, Abbott Renick, James E. Bell, John E. Crawford, Frank D. Lamb and John D. Sargent. *Engineering and Mining Journal,* v. 156, Feb. 1955, p. 102-106.

Includes tables. (A4, EG-a)

44-A. Metallurgical Principles Applied to Product Design. II. J. A. Burgard. *Western Machinery and Steel World,* v. 46, Feb. 1955, p. 104-105, 151.

Design of parts to be welded; weight considerations; strength requirements. Diagrams. (A general)

45-A. (German.) **Artificial Elements. II.** G. Herrmann. *Chemische Technik,* v. 6, no. 12, Dec. 1954, p. 663-670.

Formation and properties of elements 93 to 100. Tables. (To be continued.)

(A general, Np, Pu, Am, Cm, Cf)

46-A. (Book—English.) **Competition Between Steel and Aluminum. United Nations Economic Commission for Europe, Steel Committee.** 156 p. 1954 United Nations, Sales Section, European Office, Palais des Nations, Geneva, Switzerland; also Columbia University Press, 2960 Broadway, New York 27, N. Y. $1.25.

Trends in production and trade; prices and costs; applications in various industries.

(A4, T general, Al, ST)

47-A. (Book.) **Engineering Metallurgy.** E. M. H. Lips. 250 p. 1954. N. V. Philips' Gloeilampenfabrieken, (Philips Technical Library) Eindhoven, Netherlands. $6.25. (Translated from the Dutch by A. H. Teves-Acly.)

Metallurgical fundamentals and data of direct interest and value to design engineers. (A general)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

48-A. (Book.) **A Glossary of Terms in Nuclear Science and Technology.** National Research Council. 206 p. 1953. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. $7.00.

Proposed American standards in physics, reactor theory and engineering, chemistry, chemical engineering, biophysics, radiobiology, instrumentation, isotopes separation, and metallurgy. (A10)

49-A. (Book.) **Regional Technical Meetings, 1954.** 337 p. 1955. American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y.

Collection of papers presented at five regional meetings. Papers were previously abstracted from preprints. (A general, ST)

50-A. (Book—German.) **Handbook of Metallurgy.** Victor Tafel. v. I. 2nd Ed. **Gold, Silver, Platinum Metals, Copper, Mercury, Bismuth.** 693 p. 1951. v. II. 2nd Ed. **Lead, Tin, Antimony, Zinc, Cadmium.** 760 p. 1953. S. Hirzel Verlagsbuchhandlung, Leipzig, Germany. $12.25.

Occurrence, production, ore processing, properties of metal and compounds, and applications for each metal.

(A general, Au, Ag, EG-c, Cu, Hg, Bi, Pb, Sn, Sb, Zn, Cd)

B Raw Materials and Ore Preparation

49-B. Effects of Quality of Scrap. J. H. Flaherty, Jr. **Inspection and Effect of Grades of Scrap.** H. M. Parker. **Effect of Quality of Scrap in the Open Hearth.** A. K. Moore. **Selection and Use of Scrap.** G. G. Mueller. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings,* v. 37, 1954, p. 55-61; disc., p. 61-62.

Results of mill tests on effects of size, condition and composition of scrap on yield and quality of steel. Tables, graphs. (B22, D2, ST)

50-B. Recent Developments in Manganese Supply. Russell C. Buehl. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings,* v. 37, 1954, p. 187-191; disc. p. 191-192.

Reserves, treatment of ores and refining processes. Graph. 2 ref. (B10, C general, Mn)

51-B. Froth Flotation. Robert B. Booth. *American Cyanamid Company, Mineral Dressing Notes,* no. 21, Jan. 1955, 23 p.

Materials and machines and their applications to concentration of var-

ious ores and minerals. Diagrams. 98 ref. (B14)

52-B. Quartz Flotation With Anionic Collectors. A. M. Gaudin and D. W. Fuerstenau. *Mining Engineering,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 202, Jan. 1955, p. 66-72.

Streaming potential studies show effects of pH and sodium, barium and aluminum ions on behavior of quartz ores in water. Diagrams, graphs. 19 ref. (B14)

53-B. Caustic Soda Fusion of Zirconium Ores. H. L. Gilbert, C. Q. Morrison, A. Jones and A. W. Henderson. *U. S. Bureau of Mines, Report of Investigations* 5091, Dec. 1954, 31 p.

Process for producing zirconyl chloride from zircon sand. Proposed plant design. Tables, graphs, diagrams. (B14, Zr)

54-B. Sulfidization of Tin Oxide and Volatilization of Tin Sulfide. H. W. St. Clair, B. K. Shibler and I. S. Solet. *U. S. Bureau of Mines, Report of Investigations* 5095, Dec. 1954, 24 p.

Chemistry of the sulfide volatilization process for recovery of tin from low-grade Bolivian ores. Tables, diagrams. 20 ref. (B14, Sn)

55-B. (German.) Evaporation and Melting in Suspension, a Contribution to the Processing of Lean Ores. Alfred Lange. *Metallurgie und Giessereitechnik,* v. 4, no. 12, Dec. 1954, p. 538-547.

Experiments on production of zinc and lead sulfide concentrates; effects of temperature, degree of crushing, metal content; apparatus and details of operation; economic significance. Diagrams, graphs, photographs, tables. 17 ref. (B14, Zn, Pb)

56-B. (German.) Practical Problems in the Metallurgy of Titanium. W. J. Kroll. *Metall,* v. 9, nos. 1-2, Jan. 1955, p. 1-6.

Concentration of titanium ores; removal of iron from ilmenite; selective reduction with iron; smelting furnaces; and chlorinizability of slags. Points out that the insufficiency of the world's supply of rutile makes it necessary to produce titanium from ilmenite. Tables, graphs, diagrams. (B general, C general, Ti)

57-B. Recent Developments in Flotation Practice at the Sullivan Concentrator. P. M. Elliott and J. P. Campbell. *Canadian Mining and Metallurgical Bulletin,* v. 48, no. 514, Feb. 1955, p. 55-58; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 58, 1955, p. 23-26.

Use of Dowfroth in place of standard water gas tar-creosote-cresylic acid mixture and a "dezincing" treatment of lead concentrates. Tables, graph, flow-sheet. (B14)

58-B. Ore Dressing—Review and Forecast. Milling. Iron Ore Beneficiation. Extractive Metallurgy. Nathaniel Arbiter, Fred D. DeVaney and A. W. Schlechten. *Engineering and Mining Journal,* v. 156, Feb. 1955, p. 127-138.

Includes photographs, diagram. (B13, B14)

59-B. The Processing of Uranium Ores of the Colorado Plateau by the Climax Uranium Company. Woodrow Knott. *Mines Magazine,* v. 45, Jan. 1955, p. 29-30.

Equipment and processes. (B14, U)

60-B. The Waelz Process. C. W. Jensen. *Mining Magazine,* v. 92, Feb. 1955, p. 73-79.

Process for recovery of zinc, lead, tin, antimony, cadmium, mercury, arsenic, molybdenum and thallium by vaporizing the metal from low-grade ores or residues. Table, graph. (B14, C22, Zn, Pb, Sn, Sb, Cd, Hg, As, Mo, Tl)

61-B. Dressing Tin-Columbite Concentrates. *Mining Magazine,* v. 92, Feb. 1955, p. 86-89.

Practices used in Nigeria. Flow-sheet, photograph. (B14, Sn, Cb)

62-B. (German.) Production and High-Purification of Germanium. Oskar Rösner. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 8, no. 1, Jan. 1955, p. 1-7; disc., p. 7.

Practical methods of concentrating germanium-bearing ore and of extracting as $GeCl_4$, reducing the chloride, and refining the metal. Graphs, diagrams, micrographs. (B14, C4, Ge)

63-B. (German.) Antimony-Ore Mining in Eastern Thuringia. Manfred Bachmann. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 8, no. 1, Jan. 1955, p. 7-14.

Geological conditions, ore deposits and mining, dressing and smelting practices in the various regions. Maps, tables, diagrams. 5 ref. (B10, B12, B14, Sb)

64-B. Testing Steel Plant Lime. R. Sewell. *British Steelmaker,* v. 21, Feb. 1955, p. 46-48.

Method for determining reactivity of lime from various sources. Tables, graphs. 5 ref. (B22)

65-B. Flotation of Molybdenite at the Morenci Concentrator. J. E. Papin. *Mining Engineering,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 202, Feb. 1955, p. 145-147.

Flotation agents, equipment and operating procedures. Tables, flow-sheet. (B14, Mo)

66-B. (Pamphlet.) The Iron Ore Outlook of the United States. Earl Morgan Richards. 24 p. 1954. Bucknell University Press, Lewisburg, Pa.

Known reserves; economics of recovery. (B10, A4, Fe)

C

Nonferrous Extraction and Refining

36-C. The Preparation of Polonium Metal and Polonium Dioxide. K. W. Bagnall and R. W. M. D'Eye. *Chemical Society, Journal,* 1954, Dec., p. 4295-4299.

Milligram quantities used mostly in X-ray and spectral studies of Polonium-210. 17 ref. (C general, Po)

37-C. Electrolytic Preparation of Molybdenum From Fused Salts. IV. Preparation of Reduced Molybdenum Chlorides From Molybdenite Concentrate. Seymour Senderoff and Roger J. Labrie. *Electrochemical Society, Journal,* v. 102, Feb. 1955, p. 77-80.

Chlorinating and subsequent reduction in aqueous and nonaqueous solutions. Tables, diagram. 4 ref. (C23, Mo)

38-C. An Attempt to Separate Titanium From Oxygen by Vacuum Sublimation, and Some Measurements of Evaporation Rates. A. B. Osborn. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 185-188.

Increased oxygen content reduced evaporation rate. Condensed titanium contained much less oxygen than the starting alloy but process is not economically feasible for industrial purification. Graph, diagram, tables. 3 ref. (C25, Ti)

39-C. Vacuum Melting. R. K. McKechnie, D. W. Green and W. F. Moore. *Metal Industry,* v. 86, Jan. 21, 1955, p. 49-50.

Future operation. Improved properties of gas-free ingots. Graphs. 3 ref. (C25, D8)

40-C. Electrolytic Recovery of Silver From Fixing Baths at Low Current Density. A. A. Rasch and J. I. Crabtree. *Photographic Science and Technique,* v. 2, Feb. 1955, p. 15-33.

Use of small recovery units. Economics of silver recovery. Photographs, graphs, tables. 20 ref. (C23, Ag)

41-C. The Preparation of Samarium Metal With Calcium. E. I. Instott. *American Chemical Society, Journal,* v. 77, Feb. 5, 1955, p. 812-813.

Samarium oxide (Sm_2O_3) is reduced by calcium metal and the samarium distilled in tantalum containers under vacuum or argon. Table. 4 ref. (C22, Sm)

42-C. Continuous Multistage Separation by Zone-Melting. W. G. Pfann. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 297-303.

Description of *zone-void* modification of the zone-melting process which uses a vertical column through which voids are passed by moving heaters. Diagrams, tables, graphs. 10 ref. (C5)

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Production of pure silicon by the reduction of silicon tetrachloride with zinc. Tables, graphs, diagrams. 10 ref. (C26, Si)

44-C. (German.) Modern Methods of Casting Light-Metal Ingots. Vincenz Fuss. *Giesserei,* v. 42, no. 2, Jan. 20, 1955, p. 25-35.

Ingot casting methods; equipment for intermittent and continuous casting. Diagrams, graphs, tables. 20 ref. (C5, Al, Mg)

45-C. (German.) Computing the Specific Skin Resistance of a Compounded Melting Charge. W. H. Scheibe. *Metall,* v. 9, nos. 3-4, Feb. 1955, p. 121-123.

Derivation of two formulas for computing specific resistance of melt and conducting crucible in induction furnaces. Diagram, graph, table. (C21, D6)

46-C. (German.) Contributions to Chemistry of the Elements Columbium and Tantalum. XIV. A New Production Method by Dissociating Columbium-Tantalum Mixtures. Harald Schäfer and Margot Jori. *Zeitschrift für anorganische und allgemeine Chemie,* v. 277, no. 6, Dec. 1954, p. 341-348.

Reducing homogeneous mixtures of the pentoxides with moist H_2 results in a tantalum-rich (Cb, Ta)$_2O_5$-phase and a columbium-rich (Cb, Ta)O_2-phase. Graphs, tables. 14 ref. (C2, Co, Ta)

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Method of purifying aluminum-antimony to improve semiconducting properties. Graphs, diagram, photograph. 9 ref. (C5, Al, Sb)

48-C. (Russian.) Electrolytic Oxidation of Carbon in Cryolite-Alumina Melts. L. N. Antipin and A. N. Khudiakov. *Doklady Akademii Nauk SSSR,* v. 100, no. 1, Jan. 1, 1955, p. 93-96.

Relation of anode potential and gas composition changes to current density. Graphs. 7 ref. (C23, Al)

49-C. (Russian.) **Formation at the Cathode of Aluminum and Sodium Subcompounds During Electrolysis of Cryolite Melts.** L. N. Antipin. *Doklady Akademii Nauk SSSR*, v. 99, no. 6, Dec. 21, 1954, p. 1019-1022.

Cathode potential and current strength. Formulas derived from experimental data. Graphs. 5 ref. (C23, A1)

50-C. (German.) **Tungsten and Molybdenum in Vacuum Technique.** R. Palme. *Planseeberichte für Pulvermetallurgie*, v. 1, no. 2, Feb. 1953, p. 61-71.

Vacuum melting, properties and uses in electric and electronics industry. Photographs, tables, graph, diagrams. 13 ref. (C25, T1, W, Mo)

51-C. (Book.) **Physical Chemistry and Metal Extraction.** D. W. Hopkins. 232 p. 1954. J. Garnet Miller Ltd., 54 Victoria Street, London, S.W.1, England. 30s. MacMillan Co., 60 Fifth Ave., New York 11, N. Y. $4.80.

Reactions between metallic compounds, metals, and slags of interest to students and operating personnel in metal extraction processes. (C general, D general)

D

Ferrous Reduction and Refining

77-D. Some Factors Affecting Open Hearth Performance. Dennis J. Carney, Joseph J. Oravec and Elgin Van Meter. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 12-41.

Extensive study on combustion air temperature thermal gradients in regenerative systems; effects of furnace design and age on air temperature and heat recovery; effects of operating variables. Diagrams, photograph, tables, graphs. 2 ref. (D2, ST)

78-D. A Statistical Approach to Melt-In Control. Stanleigh F. Elam and Franklin E. Williams. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 42-53.

Procedure for development and application of a simplified method for controlling feed ore and repig requirements. Graphs, tables. (D2, ST)

79-D. Tapping Heats Through a Bifurcated Spout Into Two Ladles. E. Courtney Sorrells. **Bifurcated Spout at Weirton.** Charles N. Straney. **Tapping Doubles Heats at Sparrows Point.** J. H. Kelley. **Bifurcated Spouts.** H. H. Northrup. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 63-69.

Operating difficulties encountered and solved in pouring double heats. Tables. (D9, ST)

80-D. Cleaning of Open Hearth Waste Gases at Fairless Works. Howard A. Parker. **Cleaning of Open Hearth Waste Gases by Kaiser Steel Corporation, California.** B. N. Dagan. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954. p. 69-78.

Construction and operation of electrostatic precipitators at two large steel plants. Photographs, table, graph. (D2, A5)

81-D. Rammed Acid Open Hearth Bottoms. H. C. Bigge. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 91-97; disc., p. 97-98.

Importance of good workmanship and proper characteristics of materials in preparing good furnace lining. Diagrams, photographs, tables. (D2)

82-D. Maintenance and Care of Open Hearth Furnace Bottom. J. S. Zahn. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 98-104; disc., p. 104-107.

Composition of sand and drying of rammed materials were found to be most important factors in obtaining good bottom life. Diagrams, photograph. (D2)

83-D. Influence of Pouring Practice on Axial Soundness of Large Ingots. S. A. Ott. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 107-108; disc., 108-110.

Factors in ingot practice for evaluating large ingots before any machining, forging or otner treatment is started. Table. (D9, ST)

84-D. Boils and Furnace Bottoms. G. R. Fitterer. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37 1954, p. 111-118; disc., p. 118-122.

Effects of slag from previous heat and condition or state of furnace bottom on oxygen content of bath. Graphs, table. 8 ref. (D2, ST)

85-D. Hot Repair Versus New Roof Installation. Paul W. Nutting, **Hot Repair or a New Roof.** E. R. Eaton. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 123-127; disc., p. 127-128.

Higher production gained by installing complete knuckle-to-knuckle roof instead of patching in many cases; examples of repair practice. Table. (D2)

86-D. Deformation Under Load at 2000° to 2500° F. and Silicate Liquid Absorption in Basic Brick. T. F. Berry, J. C. Ekedahl and R. B. Snow. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 128-145; disc., p. 145-146.

Comparison of various compositions of fired and chemically bonded brick. Tables, photographs, graphs. 6 ref. (D2)

87-D. Testing Open Hearth Refractories. G. R. Eusner and W. S. Debenham. **Control Testing of Open Hearth Pit Refractories.** Charles N. Jewart. **Control Testing of Open Hearth Refractories.** W. J. Scharfenaker. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 146-154; disc., p. 154-155.

Factors in choice of refractory; characteristics to be tested; need of close cooperation with manufacturer. Graph, table. (D2)

88-D. Improvements in Checker Cleaning During Operation. W. H. Friesell. **Checker Cleaning.** E. F. Franzen. **Open Hearth Checker Maintenance During Operation.** Robert M. Jordan. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 156-171; disc., p. 171-172.

Advantages and practices of good cleaning systems. Photographs, diagrams, tables. (D2)

89-D. Double-Pass Versus Single-Pass Checkers. F. G. Jaicks. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 172-179.

Experience on an experimental furnace in developing a satisfactory operating practice. Graph, diagrams, tables. 2 ref. (D2)

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Effects of manganese on deoxidation, hot workability and mechanical properties. (D2, Q general, ST)

91-D. Oxidation of Phosphorus and Manganese During and After Flushing in the Basic Open Hearth. John F. Elliott and Frank W. Luerssen. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 193-208; disc., p. 208-211.

Distribution between metal and slag; effects of furnace characteristics. Graphs, tables. 11 ref. (D2, ST)

92-D. Behavior of Manganese in the Basic Open Hearth. D. W. Murphy and R. S. Miltenberger. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 212-221; disc., p. 221-222.

Distribution between metal and slag for various bath compositions. Tables, graphs. 7 ref. (D2 ST)

93-D. Manganese and Formation of Inclusions. D. C. Hilty. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 222-229; disc., p. 229-233.

Changes in furnace practice to alleviate undesirable structures. Graphs, micrographs, 6 ref. (D2, ST)

94-D. Recent Developments in European Steelmaking Practice. H. B. Emerick. **American Adaptations of the Austrian Oxygen Converter Process.** W. C. Rueckel and W. A. Vogt. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 235-247; disc., p. 247-251.

Use of oxygen in blast furnaces and steelmaking operations. Graphs, tables. 8 ref. (D2, ST)

95-D. Laboratory Studies of Pouring Conditions as Revealed by High-Speed Motion Pictures. H. T. Clark. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 252-254; disc., p. 254-255.

Use of specially shaped stools and partial molds to study splashing of molten steel. Photographs. (D9, ST)

96-D. Effect of Rare Earth Additions on Surface Quality of Low-Carbon Steel. J. V. Russell. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 255-263.

Rare earth metal additions reduce sulfur content but cause hot brittleness. Rare earth oxide additions improve surface quality and reduce hot brittleness of aluminum killed steels. Table, photographs, graphs. 8 ref. (D2, CN, EG-g)

97-D. Stocking and Charging. E. E. McGinley. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 265-273.

Practice for close control of steel quality. Photograph, graphs. (D2)

98-D. Recent Uses of Open Hearth Automation. R. A. Lambert. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 274-283; disc., p. 283-284.

Benefits of automatic control of temperature and combustion processes. Photographs, charts. (D2)

99-D. Control of Melt Carbon and Working Heat. A. M. Kroner. *American Institute of Mining and Metallurgical Engineers, Open Hearth Pro-*

ceedings, v. 37, 1954, p. 284-286; disc., p. 286-288.

Control of charging and operating variables. (D2)

100-D. Elimination and Control of Air Infiltration. H. M. Parker. **Waste-Gas Analyses for Combustion Control.** Christian G. Rosenbohm. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 295-300; disc., p. 296-297, 300-301.

Advantages of close control of combustion processes. Table. (D2)

101-D. Quality Control With Low Iron Charges. H. W. Potter. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 301-305; disc., p. 305-309.

Control of residual elements arising from mixed scrap. Graph, photograph, diagram. (D2, CN)

102-D. Charging and Fluxing Practices in Cold-Metal Shops Using Burnt Lime and Low Percentage of Pig Iron. S. L. Fredericks. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 310-313; disc., p. 313.

Summary of practices in 19 open-hearth shops. Tables. (D2, ST)

103-D. Furnace Design for One Hundred Per Cent Natural Gas Firing. James L. Jennings and John R. Patton. *American Institute of Mining and Metallurgical Engineers, Open Hearth Proceedings*, v. 37, 1954, p. 320-327.

Changes in design required to make gas a satisfactory fuel. Diagrams, photographs. (D2)

104-D. European Ironmaking Practices. J. M. Walsh, Jr. *American Iron and Steel Institute, Preprint*, 1954, 27 p.

Ore treating and blast furnace practices. Diagrams, tables. (D1, B general CI)

105-D. Sulphur Distribution Between Flame and Slag in the Open Hearth Furnace. George St. Pierre. *American Iron and Steel Institute, Preprint*, 1954, 8 p.

Laboratory study shows increased slag basicity and higher temperatures increase transfer of sulfur to slag; oxygen content of flame influences sulfur transfer. Table, graphs. 7 ref. (D2, ST)

106-D. Multi-Purpose Grease Simplifies Furnace Equipment Lubrication. H. B. Jenkins. *Iron Age*, v. 175, Feb. 10, 1955, p. 104-105.

Lithium-base grease reduces blast furnace maintenance. Photographs, table. (D1)

107-D. Basic Open-Hearth Practice at Volta Redonda. L. Cook. *Iron and Steel Institute, Journal*, v.179, Jan. 1955, p. 1-17 + 1 plate.

Raw materials, furnaces, firing practice and expansion plans. Diagrams, tables, graphs, photographs. (D2, ST)

108-D. Use of a Thermal Model to Determine Temperature Under Blast-Furnace Hearths. E. J. Williams and E. J. Burton. *Iron and Steel Institute, Journal*, v. 179, Jan. 1955, p. 17-22.

Temperature contours from model agree with measurements on production furnace. Graphs, diagrams, photographs. 13 ref. (D1)

109-D. The Mechanism of the Reduction of Iron Oxides by Solid Coke. B. G. Baldwin. *Iron and Steel Institute, Journal*, v. 179, Jan. 1955, p. 30-36.

Reduction is almost entirely by gaseous reactions involving carbon monoxide and dioxide. Application of data to blast furnace process. Diagram, graphs. 20 ref. (D1, CI)

110-D. Some Starting and Operating Experiences at Abbey Melting Shop. A. J. Kesterton. *Iron and Steel Institute, Journal*, v. 179, Jan. 1955, p. 46-57.

Equipment and operating schedules for mixer bay, 200-ton furnace, scrap and raw material handling; ingot practice and use of oxygen for decarbonizing. Tables. (D2, ST)

111-D. The Application of the Manganese and Phosphorus Equilibria to the Production of High-Quality Cast Steel. F. Eisermann. *Sulzer Technical Review*, 1954, no. 2, p. 33-36.

Shows how low-phosphorus content required in high-quality steels influences movement of manganese between steel and slag. 6 ref. (D general, CI)

112-D. On the Heterogeneity of Forging Ingots. M. Nepper. *Henry Brutcher Translation* no. 3402, 7 p. Henry Brutcher, Altadena, Calif. (Slightly abridged from *Revue Universelle des Mines*, v.97, ser. 9, no. 4, 1954, p. 96-99.)

Previously abstracted from original. See item 267-D, 1954. (D3, D9, CN)

113-D. (German.) Possibility of Controlling the Blast Furnace Process by Gas Investigations. Georg v. Struve. *Metallurgie und Giessereitechnik*, v. 4, no. 12, Dec. 1954, p. 511-522.

Theoretical basis, experiments and their evaluation. Graphs, tables. (D1)

114-D. (German.) Some Improvements in the Design of the Maerz-Type Open-Hearth Furnace. Bauart Maerz and Leo Ullsperger. *Metallurgie und Giessereitechnik*, v. 4, no. 12, Dec. 1954, p. 524-528.

Improvements suggested for the head, checkers and arches. Diagrams, tables. (D2)

115-D. (German.) Simultaneous Desulfurization and Deoxidation of Steel Melts. Wilhelm Anton Fischer and Helmut Engelbrecht. *Stahl und Eisen*, v. 75, no. 2, Jan. 27, 1955, p. 70-75.

Literature and test data on effects of carbon and silicon content of the melt on sulfur removal. Graphs, table. 8 ref. (D general, ST)

116-D. (Italian and English.) Integral Cyclic Process Ironworks. Carlo Crespi. *Industria Meccanica*, v. 6, no. 4, Apr. 1954, p. 203-208.

Design and operation of ultra-modern steel plant in Italy. Diagram, photographs. (D general)

117-D. (Italian.) A Particular Combustion Process for Rich Gases and Particular Form of Open Hearth Furnace Ends Suitable for the Process. E. Bolsi. *Metallurgia italiana*, v. 46, no. 11, Nov. 1954, p. 413-416.

Control of air and fuel mixing to obtain maximum efficiency under varying conditions. Diagram, photographs, table. (D2)

118-D. (Italian.) Horizontal Pouring. V. Ferrari and D. Bellini. *Metallurgia italiana*, v. 46, no. 11, Nov. 1954, p. 417-420.

Experiments show horizontal pouring of steel ingots is practical and has technological advantages. Diagrams, photographs. (D9, ST)

119-D. (Italian.) Operational Data and Remarks on Natural-Gas Heated Open-Hearth Furnaces. C. Stocchi. *Metallurgia italiana*, v. 46, no 12, Dec. 1954, p. 446-449.

Experiences with 75% methane and 25% naphtha mixtures. Tables, diagrams. (D2)

120-D. Blast-Furnace Automation. A. W. Robinson. *Instruments and Automation*, v. 28, Feb. 1955, p. 266-269.

Control of charging program, temperature recording, blast control and gas analysis. Diagrams, photographs. 2 ref. (D1)

121-D. Vacuum Cast 150 Ton Forging Ingots in German Plant. *Iron Age*, v. 175, Feb. 17, 1955, p. 91-94.

Improved metallurgical quality and reduced manufacturing costs through combination of effects. Photographs, tables. (D8, AY)

122-D. Progress Review of Casting Bay and Soaking Pit Practice. L. H. W. Savage. *Iron & Steel*, v. 28, Feb. 1955, p. 43-48.

Study of heat losses from solidifying ingots and possibilities of retrieving some of this heat in soaking pits. Graphs, diagram. 21 ref. (To be continued.) (D9, F21, ST)

123-D. Refractories in the Iron and Steel Industry. I. Alumino-Silicates. Helen Towers. *Iron & Steel* v. 28, Feb. 1955, p. 55-59.

Progress in refractory technology since 1939. 42 ref. (D general)

124-D. A New Way to Control Arc Furnaces. Charles W. Vokac. *Iron and Steel Engineer*, v. 32, eb. 1955, p. 76-81; disc., p. 81-91.

Automatic control with a rotary generator coupled to an air counterbalanced hydraulic electrode drive. Diagrams, photographs, oscillograph. (D5, S18)

125-D. Effect of Temperature and Pouring Speed on Ingot Structure. *Iron and Steel Institute, Journal*, v. 179, Feb. 1955, p. 120-123 + 6 plates.

Studies on one-ton ingots of nickel-chromium steel. Table, photographs, micrographs. (D9, AY)

126-D. Ingot Heat Conservation. Cooling of 15-Ton Ingots Between Teeming and Stripping. L. H. W. Savage and M. D. Ashton. *Iron and Steel Institute, Journal*, v. 179, Feb. 1955, p. 132-142.

Measurements of heat losses show that a 25% reduction in standing time between teeming and stripping is feasible and would result in saving of soaking pit fuel. Diagrams, photographs, tables, graphs. 3 ref. (D9, ST)

127-D. The Formation and Decomposition of Hercynite ($FeO \cdot Al_2O_3$). B. G. Baldwin. *Iron and Steel Institute, Journal*, v. 179, Feb. 1955, p. 142-146 + 1 plate.

Effects of various oxide-additions on rate of formation of $FeO \cdot Al_2O_3$ under blast furnace conditions. Refractogram, graphs. 5 ref. (D1, Fe)

128-D. Sulphur Partition Between Gas, Slag, and Metal Phases Under Iron and Steelmaking Conditions. E. T. Turkdogan. *Iron and Steel Institute, Journal*, v. 179, Feb. 1955, p. 147-154.

Data indicate that sulfur reaches equilibrium between slag and metal. Graphs, tables. 31 ref. (D general, CI, ST)

129-D. Burdening the Blast Furnace. I. Ore. II. Coke. III. Flux. IV. Furnace Operation. M. W. Lightner. *Steel*, v. 136, Feb. 7, 1955, p. 116 + 6 pages; Feb. 14, 1955, p. 92 + 4 pages; Feb. 21, 1955, p. 82, 94, 87; Feb. 28, 1955, p. 96, 98, 102.

Effects of ore, coke and flux characteristics on blast furnace performance; effects of burden distribution and gas-permeability on furnace operation. Photograph, tables, graphs. (D1, Fe)

130-D. (French.) Preparation of the Charge at Esperance-Longdoz. Schmidt Rotary Furnaces. M. Gérard. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques*, v. 12, no. 1, 1955, p. 133-168.

Analysis of results on the agglomeration of blast furnace dusts in a rotary furnace; description of installations. Diagrams, tables, graphs. (D1, A5)

131-D. (French.) Interest in the Use of a Low-Carbon Cast Iron Prepared

in the Hot-Blast Cupola as an Open-Hearth Charge. Boutigny and Barbazanges. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 12, no. 1, 1955, p. 169-192.

Use and advantages of hot-blast cupola for melting pig iron for open-hearth charges. Graphs, tables, diagrams, photographs. (D2, E10, CI)

132-D. (French.) **Study of the Variation of the Principal Chemical Constituents as a Function of the Sampling Area.** Hentz. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 12, no. 1, 1955, p. 193-200.

Variations in the carbon, phosphorus and sulfur contents of a steel ingot. Tables, diagrams. (D9, S12, CN)

133-D. (German.) **The Hot-Blast Cupola Furnace in the Steel Plant.** *Archiv für das Eisenhüttenwesen,* v. 26, no. 1, Jan. 1955, p. 1-8.

Effect of temperature and silicon content on carbon in cupola iron; oxygen blast; desulfurizing; heat losses; practical observations. Diagrams, tables, graphs. 28 ref. (D3, E10, CI)

134-D. Continuously Cast Wide Range of Alloy Steels. J. Selron. *Iron Age,* v. 175, Feb. 24, 1955, p.88-90.

Continuously cast stainless, heat resisting, electrical and toolsteels show mechanical properties comparable to conventional ingot-cast steels. Photographs, tables. (D9, Q general, AY)

135-D. (Book.) **Blast Furnace, Coke Oven and Raw Materials Committee, Proceedings,** v. 13, 1954. 241 p. American Institute of Mining and Metallurgical Engineers, Inc., 29 W. 39th St., New York 18, N. Y.

Fifteen papers on agglomeration and raw materials, coal and coke, and blast furnace theory and gas. (D1 B22, ST)

136-D. (Book.) **Cost Factors in Selecting Processes for Producing Iron and Steel.** Hamnett P. Munger. 59 p. 1954. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Considerations for locating a new iron and steel industry. Calculations for a hypothetical plant. (D general, A4)

137-D. (Book.) **Open Hearth Proceedings,** v. 37, 1954, 360 p. American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York 18, N. Y.

Contains 50 papers covering acid and basic openhearth practice. Papers are individually abstracted. (D2)

E Foundry

112-E. Cupola Gas Scrubbers. O. J. Brechtelsbauer. *American Foundryman,* v. 27, Feb. 1955, p. 34-37.

Wet gas scrubbers proved economical solution to cupola emission problem. Photographs, diagrams, table. (E10)

113-E. Casting Steel Pots for Metallurgical Use. T. R. Stanley. *American Foundryman,* v. 27, Feb. 1955, p. 42-46.

Production of large castings for handling molten lead and hot slag. Photographs. (E11, CI)

114-E. Reproducibility of Core Sand Tests. O. Jay Myers. *American Foundryman,* v. 27, Feb. 1955, p. 54-63.

Ways to minimize effects of variables in routine testing procedures. Photographs, tables, graphs, diagram. 22 ref. (E18)

115-E. Fahralloy Foundry Saves With Cost and Quality Control. K. Blake. *Canadian Metals,* v. 18, Feb. 1955, p. 29-30.

Methods which have gained these objectives. (E general, CI)

116-E. Importance of Slag Control in Acid Cupola Operation. E. A. Loria. *Foundry,* v. 83, Feb. 1955, p. 84-87, 240, 242-245.

Effects of slag compositions and characteristics on metal composition. Diagram, graphs, table. 6 ref. (E10, CI)

117-E. Operating Practice With the Basic-Lined Cupola. Charles Greenlee. *Foundry,* v. 83, Feb. 1955, p. 88 + 7 pages.

Advantages of basic operation are lower sulfur pickup, greater carbon pickup, higher tap temperatures, cheaper charge materials, better pouring characteristics and more uniform metal. Diagrams, table, photographs. (E10, CI)

118-E. Use of Rice and Oat Hulls as Riser Insulation. S. L. Gertsman and R. K. Buhr. *Foundry,* v. 83, Feb. 1955, p. 92-94.

Evaluation tests show that 3-in. covering produce sound castings with no carbon buildup. Graphs, tables, diagram, photographs. 1 ref. (E22, CI)

119-E. Planning Influences Pattern Quality. Robert H. Herrmann. *Foundry,* v. 83, Feb. 1955, p. 100-105.

Practices for insuring high-quality patterns. Photographs. (E17)

120-E. Development of the Lost-Wax Process of Precision Casting, 1949-53. J. S. Turnbull. *Foundry Trade Journal,* v. 98, Jan. 13, 1955, p. 31-39; Jan. 20, 1955, p. 65-74.

Appraisal of techniques, advantages, economic considerations. Photographs, diagrams. (E15)

121-E. Cleaning of Castings. L. B. Childe. *Foundry Trade Journal,* v. 98, Jan. 27, 1955, p. 87-97.

Processes and equipment for abrasive blasting to remove foreign material, flashes and surface roughness from castings. Photographs, graph. (E general, L10)

122-E. How Redesign Boosted Strength of Cast Iron Compressor Cylinder. T. H. Burke. *Iron Age,* v. 175, Feb. 10, 1955, p. 100-103.

Includes diagrams, photographs, tables. (E general, CI)

123-E. Shell Molding—The Process and Its Possibilities. Otto W. Winter. *Tool Engineer,* v. 34, Feb. 1955, p. 73-82.

Tool engineering is rapidly advancing the art of shell mold casting because it lends itself so well to automatic operations. Photographs, diagrams. (E16)

124-E. Tuyere for Blowing Oxygen Into Forehearth of Cupola. V. A. Fuklev and M. A. Khabarov. *Henry Brutcher Translation no.* 3299, 7 p. Henry Brutcher, Altadena, Calif. (From *Liteinoe Proizvodstvo,* v. 3, no. 9, 1952, p. 24-25.)

Design, operation and performance of tuyere for superheating cast iron during production. Diagrams, graph. (E10, CI)

125-E. 'Drying' (Hardening) of Foundry Sand Molds by the Use of Carbon Dioxide. S. I. Sysoev. *Henry Brutcher Translation no.* 3410, 3 p. Henry Brutcher, Altadena, Calif. (From *Liteinoe Proizvodstvo,* v. 3, no. 1, 1952, p. 5.)

Application and advantages of molds and cores prepared by a chemical baking process. 1 ref. (E19, CI, ST, Cu, Al)

126-E. Carbon Dioxide in Molding Sand Produces High-Strength Molds. W. Magers. *Henry Brutcher Translation no.* 3411. 4 p. Henry Brutcher, Altadena, Calif. (From *Giesserei-Praxis,* v. 71, no. 23, 1953, p. 418.)

Critical examination of the process and suggestions for its improvement. (E19)

127-E. (French.) **Gravity Die Casting of Light Alloys. IV.** Henry Garnier. *Revue de l'aluminium,* v. 31, no. 215, Nov. 1954, p. 391-396.

Linear shrinkage, dimensions, inserts, molds, melting and pouring. Diagrams. 4 ref. (E13, E23, Al)

128-E. (German.) **Evaluating Coke With Cupola Research.** Hans Jungbluth. *Giesserei,* v. 42, no. 1, Jan. 6, 1955, p. 2-6.

Coke-evaluation index; relations between melting efficiency, coke charge, amount of air and combustion conditions; reactivity of various cokes; mechanism of raising the temperature of the iron. Graphs, table. 22 ref. (E10)

129-E. "Pop-Off"-Type Moulding Boxes for the Mechanized Production of Light Castings. A. J. Crook. *Foundry Trade Journal,* v. 98, Feb. 10, 1955, p. 141-148.

Description of full mechanization of foundry where previously loose-pattern molding methods had been used. Photographs, diagrams. (E19, CI)

130-E. Another Look at "Expansion"-Type Scabs. Douglas C. Williams. *Foundry Trade Journal,* v. 98, Feb. 17, 1955, p. 169-174.

Hypothesis for explaining formation of scabs in iron and steel castings. Photograph, tables. 8 ref. (E11, CI)

131-E. Plaster Mold Casting. R. B. Anderson. *Product Engineering,* v. 26, Feb. 1955, p. 193-199.

Technique and applications of this somewhat limited process. Tables, photographs. (E16, Cu, Zn, Al)

132-E. (French.) **Preparation Standard for A-S20 U.** *Fonderie,* 1955, no. 108, Jan., p. 4337-4339.

Procedure for melting and casting hypereutectic aluminum-silicon alloys containing copper and possibly tin. Micrographs. (E10, Al, Si, Cu, Sn)

133-E. (French.) **Mechanization of Foundry Processes.** J. Pascal. *Métallurgie et la construction mécanique,* v. 87, no. 1, Jan. 1955, p. 23, 25-27.

Means for transporting liquid metal. Economics of mechanization. 7 ref. (E general, A5)

134-E. (German.) **Orienting Experiments on Foundry Practice.** Ludger Frede. *Giesserei,* v. 42, no. 2, Jan. 20, 1955, p. 41-42.

Experimental study of flow in molds. Diagrams, photographs. 3 ref. (E23)

135-E. (German.) **Dielectric Drying of Cores.** Kaarlo Wirta. *Giesserei,* v. 42, no. 3, Feb. 3, 1955, p. 49-54.

Principle and design of high-frequency core-drying furnaces; laboratory investgations on cores with different binders, water contents and pH values; process is not suitable for cores with oil binders. Diagrams, photographs, graphs, tables. 1 ref. (E21)

136-E. (German.) **Effect of Foundry Sand on the Finished Casting.** Hans Derlon. *Giesserei,* v. 42, no. 3, Feb. 3, 1955, p. 55-57.

Effect of type, shape and grain size of sand and gas permeability of mold on the quality of the casting. Diagram, micrographs, graphs. 8 ref. (E18)

137-E. (German.) **Plant Experiences With the Graphite-Bar Melting Fur-**

nace. H. Reinfeld. *Giesserei*, v. 42, no. 3, Feb. 3, 1955, p. 60.
Brief report on the efficiency of furnace. Graphs. 1 ref. (E10)

138-E. (German.) **The Effect of Extremely Low Beryllium Contents in Magnesium Alloys.** Karl Ernst Mann. *Zeitschrift für Metallkunde*, v. 46, no. 1, Jan. 1955, p. 17-24.
Effect of beryllium on the casting behavior, mechanical and chemical properties, surface condition and microstructure of magnesium-aluminum alloys. Graphs, photographs, micrographs, tables. 8 ref. (E25, Q general, M27, Mg, Al)

139-E. (Russian.) **Prevention of Contraction Porosity of Chill Cast Magnesium Alloys.** A. M. Osokin. *Liteinoe Proizvodstvo*, 1955, no. 1, Jan., p. 1-3.
Optimum conditions of casting and heat treatment for prevention of porosity. Tables, photographs. 2 ref. (E25, Mg)

140-E. (Russian.) **Production of High-Strength Cast Iron in a Forehearth Cupola Furnace.** I. P. Petrov. *Liteinoe Proizvodstvo*, 1955, no. 1, Jan., p. 3-5.
Introduction of metallic magnesium and ferrosilicon directly in the forehearth; furnace construction. Table, micrographs, diagram. (E10, CI)

141-E. (Swedish.) **Casting Defects and Their Causes. VI. Mold Wall Analysis.** *Gjuteriet*, v. 45, no. 1, Jan. 1955, p. 1-5.
Factors affecting properties of mold surfaces. Table. (To be continued.) (E25)

142-E. Nondestructive Testing Aids Casting Design. Robert H. Herrmann. *Foundry*, v. 83, Mar. 1955, p. 84-87.
Use of brittle lacquer and strain gages to aid in redesign or load-bearing castings. Photographs. (E17, Q25)

143-E. Reclaiming Core Sand. William D. Dunn. *Foundry*, v. 83, Mar. 1955, p. 90-95.
Factors to be analyzed before installing sand reclamation in nonferrous foundries. Diagrams, photographs, tables. (E18)

144-E. A Study of Investment Materials. H. O. McIntyre. *Foundry*, v. 83, Mar. 1955, p. 96-99.
Characteristics and applications of usual investment materials. Photographs, graphs. (E15)

145-E. New Ingot Mold Foundry. Edwin Bremer. *Foundry*, v. 83, Mar. 1955, p. 100-105.
Equipment and operations in highly mechanized foundry. Photographs, diagram. (E general, CI)

146-E. The Use and Care of Crucibles. W. M. Halliday. *Foundry*, v. 83, Mar. 1955, p. 106-109.
Safety and economic considerations for handling, storing and use of graphite crucibles. Photographs. (E10)

147-E. Production of Large Steel Castings. J. B. Mohler. *Foundry*, v. 83, Mar. 1955, p. 113-115.
Practice used for molding and pouring castings larger than 150 tons each. Photographs. (E19, E23, CI)

148-E. Colloidal Graphite Mixtures Aid Nonferrous Casting Techniques. W. A. Mader. *Iron Age*, v. 175, Mar. 3, 1955, p. 124-126.
Benefits of graphite coatings on chills, cores, dies and pins; use as lubricant on foundry machines. Photographs. (E25)

149-E. (Book.) **Shell Molding and Shell Molding Castings.** T. C. Du Mond. 128 p. 1954. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $2.00.
Description of process, advantages and limitations, costs, and factors influencing selection of the process for various castings. (E16)

F

Primary Mechanical Working

47-F. Substitutes for Palm Oil in the Cold Rolling of Steel. W. R. Johnson, Harry Schwartzbart and J. P. Sheehan. *American Iron and Steel Institute, Preprint*, 1954, 27 p.
Laboratory and mill tests to evaluate lubricants show that palm oil and modified tallow offer best lubricity. Tables, graphs. 4 ref. (E23, F1, ST)

48-F. Sixty-Cycle Induction Heating of Large Steel Sections for Hot Forming. III. C. H. Hartwig. *Industrial Heating*, v. 22, Jan. 1955, p. 46, 48, 190-194.
Temperature, current and power curves for heating larger ingots of carbon, silicon, nonmagnetic stainless and high speed toolsteels. Graphs, tables. (To be continued.) (F21, J2, ST)

49-F. Some Factors Affecting the Quality of Extrusions. IV. Christopher Smith and Norman Swindells. *Industrial Heating*, v. 22, Jan. 1955, p. 100, 102, 104, 106.
Heat treatment of aluminum extrusions and final processing of copper extrusions. 7 ref. (F24, J general, Cu, Al)

50-F. Modernization of Rod Mill at Steel Company of Canada. D. W. McLean. *Iron and Steel Engineer*, v. 32, Jan. 1955, p. 59-63; disc., p. 63-65.
Solutions of the technical and operating problems. Diagrams, photographs. (F27, ST)

51-F. Electrical Features of Universal Slabbing and Hot Strip Finishing Mills at Fairless. Warren Reid and R. H. Wright. *Iron and Steel Engineer*, v. 32, Jan. 1955, p. 97-104; disc., p. 104-105.
Unusually high power features main drives. Photographs, circuit diagrams, graphs. (F23)

52-F. Guides and Strippers for Modern Rod and Bar Mills. F. Starkey. *Iron and Steel Institute, Journal*, v. 179, Jan. 1955, p. 58-75.
Various designs and factors controlling selection. Diagrams, photographs. 3 ref. (F27, F23, ST)

53-F. Problems of Forging. G. W. Richards. *Metal Industry*, v. 86, Jan. 28, 1955, p. 63-66.
Causes of high internal stresses in high-strength aluminum alloy forgings. Photographs, graphs. (F22, Q25, Al)

54-F. A Comparison of Lubricant Carriers for Stainless Steel Wire. H. Kuntze and A. Pomp. *Wire Industry*, v. 22, Jan. 1955, p. 58, 61-62, 65. (Digest from *Stahl und Eisen*, v. 74, no. 21, Oct. 7, 1954, p. 1325-1334.)
Previously abstracted from the original. See item 391-F, 1954. (F1, F28, C-n, SS)

55-F. Distribution of Pressure Over the Contact Area in Rolling. I. G. Astakhov. *Henry Brutcher Translation no.* 2906, 6 p. Henry Brutcher, Altadena, Calif. (Condensed from *Trudy Moskovskogo Instituta Stali im, I. V. Stalina*, Symposium no. 30 on "Structure and Properties of Steel", 1951, p. 147-180.)
Contact pressure variations on metal strips of different widths; influence of amount of cold reduction on distribution in direction of rolling; effect of rolling speed and lubricant on character and magnitude of pressure between strip and rolls. Graphs, table. 3 ref. (F23, F1, Cu, ST)

56-F. (French.) **Study on the Ingot and Its Yield.** Dargent. *Centre de Documentation Sidérurgique, Circulaire d' Informations Techniques*, v. 11, no. 12, 1954, p. 2315-2322.
Methods for decreasing ingot consumption in rolling of plates. Tables. (F23, D9, CN)

57-F. (German.) **Layout and Operation of the New Strip Mill Train at Mülheim (Ruhr).** Joachim Achtelik. *Stahl und Eisen*, v. 74, no. 27, Dec. 30, 1954, p. 1767-1773.
Range of products; evaluation of experience to date. Diagrams, photographs, tables, graph. (F23, ST)

58-F. (German.) **Computing the Average Length in Rolling Steel Shapes With Flanges and Webs.** Alfred Bahr. *Stahl und Eisen*, v. 75, no. 2, Jan. 27, 1955, p. 95-96.
Simple formula for computing average elongation during rolling of any steel shape. Diagrams, table. 10 ref. (F23, ST)

59-F. (German.) **Scaling and Surface Decarburization as an Undesirable Result of Heating for Forging.** Dietrich Horstmann. *Stahl und Eisen*, v. 75, no. 2, Jan. 27, 1955, p. 97.
Effects of temperature, oxygen concentration, time and type of steel. Graphs, nomogram. 3 ref. (F21, F22, ST)

60-F. (Russian.) **Calculation of Pressure of Metal on Rolls During Cold Rolling, Taking Into Consideration Strain and Cold Hardening.** A. I. Tselikov and A. V. Tret'iakov. *Vestnik Mashinostroeniia*, v.34, no. 12, Dec. 1954, p. 10-12.
Mathematical treatment. Graphs, diagrams, table. 4 ref. (F23, CN)

61-F. (Russian.) **Problem of the Impact of Metal on the Rolling Mill Table Rollers.** F. F. Gorodkov. *Vestnik Mashinostroeniia*, v. 34, no. 12, Dec. 1954, p. 12-16.
Two particular cases studied in detail on basis of plastic mechanics. Diagrams, graph. 7 ref. (F23, Q23)

62-F. 60-Cycle Induction Heating for Forging and Extrusion. John A. Logan. *Industrial Heating*, v. 22, Feb. 1955, p. 282 + 14 pages.
Specialization and developments in the heating of ferrous and nonferrous metals. Photographs, graphs, diagram. (F21, F22, F24, J2, Al, Mg, Cu, SS, AY)

63-F. Hot Rolling. Z. Wusatowski. *Iron & Steel*, v. 28, Feb. 1955, p. 49-54.
Evaluation of factors influencing draft, spread and elongation of steel during rolling. Diagrams, graphs, tables. 18 ref. (To be continued.) (F23, ST)

64-F. Hot Rolling With the Planetary Mill. H. M. Walter. *Iron & Steel*, v. 28, Feb. 1955, p. 68-71.
Fundamentals of Sendzimir rolling mill and theory of its operation. Diagrams, photographs. (To be continued.) (F23)

65-F. The Modern Continuous Weld Pipe Mill. L. V. Johnson. *Iron and Steel Engineer*, v. 32, Feb. 1955, p. 70-75; disc., p. 75.
Equipment and operating procedures. Photographs. (F26, K general, CN)

66-F. Mechanical Features of Great Lakes 45 × 90-In. Universal Slabbing Mill. Phillip C. Vetter. *Iron and Steel Engineer*, v. 32, Feb. 1955, p. 112-116; disc., p. 116.

Equipment and operating characteristics. Photographs. (F23)

67-F. Electrical Features of Great Lakes 45 × 90-In. Universal Slabbing Mill. Harold C. Hoeft. *Iron and Steel Engineer,* v. 32, Feb. 1955, p. 117-121; disc., p. 121-122.

Drive and its auxilliary equipment. Photographs, circuit diagrams, graphs. (F23)

68-F. The Rolling of Metals and Alloys. III. E. C. Larke. *Sheet Metal Industries,* v. 32, no. 334, Feb. 1955, p. 139-144.

Methods of thickness control. Photographs, tables, graph, 14 ref. (To be continued.) (F23)

69-F. (German.) **Flame Shaping and Straightening.** Richard Pfeiffer. *Schweisstechnik,* v. 8, no. 11, Nov. 1954, p. 128-131.

Principles and rules; relationship between heat, stress and deformation and equipment. Photographs, diagrams. (To be continued.) (F29, G22)

70-F. (German.) **Recent Investigations on the Drawing and Pushing-In of Steel Bars. I.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 75, no. 3, Feb. 10, 1955, p. 162-169.

Present state of development in the bright drawing of steel bars. Micrographs, table, graphs. 15 ref. (F27, CN)

71-F. (German.) **Experiences in the Rolling and Rerolling of Wide Strip in Multiple-Stand Cold Rolling Mills.** Vincenz Seul and Joseph Billigmann. *Stahl und Eisen,* v. 75, no. 3, Feb. 10, 1955, p. 144-162.

Characteristics of German equipment and operating practice. Tables, photographs, graphs, diagrams. 105 ref. (F23, CN)

72-F. (German.) **Thermal and Mechanical Stresses on Extrusion Dies.** Kurt Laue. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 1-6.

Survey of basic stress computations; principles of selection of suitable materials; extrusion characteristics of typical magnesium, aluminum, zinc, and copper alloys and special steels. Graphs, photograph, tables. (F24, TS, Mg, Al, Zn, Cu, AY)

73-F. (German.) **Ultrasonic Shrink-Fit Testing of Ingot Receptacles for Extrusion Presses.** Max Hetzler and Alfred Michalski. *Zeitschrift für Metallkunde,* v. 46, no. 1, 1955, p. 6-11.

Testing the fit of shrunk-on receptacle reinforcements; factors which influence the evaluation of results. Diagrams, graphs, photographs. 4 ref. (F24, S14, TS)

74-F. (Russian.) **Force Relations During Blooming.** E. S. Rokotian. *Vestnik Mashinostroeniia,* v. 35, no. 1, Jan. 1955, p. 25-29.

Formulas for calculating rolling pressures and other factors. Graphs, tables. 3 ref. (F23, ST)

75-F. (Book.) **Fundamentals of the Working of Metals.** G. Sachs. 158 p. 1954. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. $4.75.

Basic phenomena which determine the performance of metallic materials during mechanical working. (F general, G general)

G
Secondary Mechanical Working

59-G. Machining Titanium. An Investigation Into the Machining of Ti-150A Alloy in the Forged State. I. Drilling and Turning Tests. Tool-Life. J. T. D. Holt and J. Purcell. *Aircraft Production,* v. 17, Feb. 1955, p. 60-64.

Drilling and cutting forces; effects of tool shape, cutting speeds and lubricants on tool life. Photograph, tables, graphs, diagram. (G17, Ti)

60-G. On the Drilling of Metals. I. Basic Mechanics of the Process. C. J. Oxford, Jr. *ASME, Transactions,* v. 77, Feb. 1955, p. 103-111; disc., p. 111-114.

Effects of drill design, material properties and cutting conditions on complex phenomena of twist drill cutting action. Diagrams, photographs, micrographs, graphs. 16 ref. (G17)

61-G. The Shear Stress in Metal Cutting. M. C. Shaw and Iain Finnie. *ASME, Transactions,* v. 77, Feb. 1955, p. 115-123; disc., p. 123-125.

Discrepancies between torsion tests and cutting stress-strain data. Specimen size effect in cutting seems to be the most important factor. Diagrams, graphs, micrograph. 32 ref. (G17, Q1)

62-G. Economic Aspects of Grinding Sintered Carbide Tools With Diamond Grinding Wheels. J. Witthoff. *Engineers' Digest,* v. 16, Jan. 1955, p. 22-26. (From *Technische Mitteilungen Krupp,* v. 5, no. 12, Sept. 1954.)

Use of diamond wheels resulted in decreased costs, chiefly due to increased tool life. Tables, graphs, photograph. (G18, C-n)

63-G. Machining the Copper Alloys. *Steel,* v. 136, Feb. 7, 1955, p. 108-110.

Speeds, feeds and lubricants for turning, milling, drilling and reaming. Tables. (G17, Cu)

64-G. Economical Speeds and Feeds for Production Turning. *Tool Engineer,* v. 34, Feb. 1955, p. 119-124.

Data based on dynamometer tests with tools made of various alloys. Tables. (G17)

65-G. Machining With Ultrasound. Thomas A. Dickinson. *Western Machinery and Steel World,* v. 46, Jan. 1955, p. 72-74.

Quick and efficient shaping of hard and brittle materials with the Cavitron. Photographs. (G17, C-n)

66-G. Use of Cutting Fluid in High-Speed Counterboring of Gray Iron. T. F. Terlikova. *Henry Brutcher Translation no.* 3158, 6 p. Henry Brutcher, Altadena, Calif. (From *Vestnik Mashinostroeniia,* v. 33, no. 5, 1953, p. 59-61.)

Effects of counterboring and tool geometry upon machine precision and surface finish; nature of wear of carbide-tipped counterbore. Graphs. (G21, G17, CI)

67-G. (Russian.) **A New Technological Method of Production of Cermet "Electrode-Tools" for Electric-Spark Machining of Metals.** E. A. Volodin and L. A. Kovsharova. *Vestnik Mashinostroeniia,* v. 34, no. 12, Dec. 1954, p. 56-57.

Method, installation, conditions of operation and material used. Photograph, diagrams. (G17, H general, Cu)

68-G. Hot Formed Magnesium Skins Save Weight and Time. R. H. Owen. *Aero Digest,* v. 70, Feb. 1955, p. 52, 54, 56.

Techniques for hydraulic, drop hammer, punch press and brake forming of aircraft control surfaces. Photographs. (G1, Mg)

69-G. High Power Spark Erosion Machine. L. R. Blake. *Engineer,* v. 199, Feb. 18, 1955, p. 222-226.

Circuits and operating characteristics. Diagrams, photographs, graphs. 3 ref. (G17)

70-G. Adaptability of Metals to Spinning. *Materials & Methods,* v. 41, Feb. 1955, p. 131.

Data sheet. (G13)

71-G. New Method for Machining Sintered Tungsten. Roberto Levi. *Precision Metal Molding,* v. 13, Mar. 1955, p. 58-60.

Technique consists of infiltrating fully sintered porous ingot with a metal followed by machining and then removing the infiltrant by volatilization. Photographs, micrograph, table. 3 ref. (G17, H16, W)

72-G. Factors Affecting the Use of Hydraulic and Crank Presses for Cold-Working Operations. A. R. E. Singer. *Sheet Metal Industries,* v. 32, no. 334, Feb. 1955, p. 85-91, 144.

Economic, technical and metallurgical considerations in selecting metalworking machines. Graphs, table. 9 ref. (G1)

73-G. Electrolytic Grinding—Its Status and Future. George Comstock. *Steel Processing,* v. 41, Feb. 1955, p. 97-99.

Equipment and methods. Future prospects. Photographs, diagram, table. (G18)

74-G. Problems in Press Tool Design. I. Blanking, Piercing and Allied Operations. J. A. Grainger. *Steel Processing,* v. 41, Feb. 1955, p. 104-112, 124.

Design factors for progressive dies. Diagrams, photographs. (G1)

75-G. Developments in the Flame-Cutting of Ship Plate. Richard R. Sillifant. *Welding and Metal Fabrication,* v. 23, Feb. 1955, p. 40-47.

Improvements in machine designs and cutting techniques. Photographs, diagrams, tables. (To be continued.) (G22, CN)

76-G. (Italian.) **Inconveniences Encountered in the Mechanical Working of Stainless Steels.** *Industria Meccanica,* v. 6, no. 12, Dec. 1954, p. 662-665.

Problems encountered in turning, shaping, drilling, extruding, milling, broaching and boring of stainless steel. (G17, G5, SS)

77-G. (Russian.) **Present State and Future of Industrial Application of Electrical Methods of Machining Metals.** V. I. Rassokhin and A. L. Livshits. *Stanki i Instrument,* v. 26, no. 1, Jan. 1955, p. 8-12.

Theory; technological characteristics of experimental machine tools; advantages and disadvantages. Diagrams, photographs. (G17)

78-G. (Russian.) **Rapid Heating of Blanks for Stamping.** A. D. Assonov. *Vestnik Mashinostroeniia,* v. 35, no. 1, Jan. 1955, p. 76-77.

Temperature and time of heating; physical properties of the metal; gas heating and control problems; induction heating. Diagram. (G3, J general, ST)

79-G. Flame-Straightening Bent Beams. Herman C. Phelps. *Welding Engineer,* v. 40, Mar. 1955, p. 24-25.

Procedures for localizing heated areas and application of force to restricted portions of the work. Photographs. (G22)

80-G. (Pamphlet.) **A Study of the Tangential and Normal Cutting Forces Produced When Machining Titanium.** L. V. Colwell and R. M. Caddell. PB 111479, July 1953, 7 p. + 24 plates. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Factors influencing behavior of cutting forces; criteria determining most efficient machining practice for a given product or operation. Tables, graphs. (G17, Ti)

81-G. (Pamphlet.) **Turning Titanium With Sintered Carbide Tools.** L. V.

Colwell. PB111480, June 1953, 5 p. + 24 plates. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Combinations of carbide material and tool shape most satisfactory under representative commercial conditions. Graphs. (G17, Ti)

H
Powder Metallurgy

90-H. How to Produce Hard, Tough Steel Parts From Powder Metal. J. W. Young. *Iron Age,* v. 175, Feb. 3, 1955, p. 119-122.

Manufacturing methods, properties of parts. Tables, diagrams, graphs, photographs. (H general, ST)

91-H. Progress in Powder Metallurgy. H. W. Greenwood. *Metallurgia,* v. 51, no. 303, Jan. 1955, p. 33-35.

Important developments in production, sintering and infiltration techniques. 14 ref. (H general)

92-H. Porous Metal Components. Potentialities of Sintered Metal Powders for Special Uses. *Metal Treatment and Drop Forging,* v. 22, Jan. 1955, p. 3-8.

Applications in filtering of chemicals through stainless steel, de-icing of aircraft and cooling of gas-turbine blades. Photographs, diagram. 6 ref. (H general)

93-H. Investigation of Process of Density Increase of Single-Phase Metal-Powder Compacts. III. Relationships Determining the Volume Changes of Metal-Powder Compacts During Sintering. V. A. Ivensen. *Henry Brutcher Translation no.* 2987, 21 p. Henry Brutcher, Altadena, Calif. (Abridged from *Zhurnal Tekhnicheskoi Fiziki,* v. 18, no. 10, 1948, p. 1290-1305.)

Constancy of relative decrease in volume of voids of copper and cobalt powders during sintering within complete or limited range and of green densities of initial compact. Graphs, table. 4 ref. (H15, Cu, Co)

94-H. Analysis of Continuity of One Phase in a Powder Mixture of Two Phases. F. Forscher. *Franklin Institute, Journal,* v. 259, Feb. 1955, p. 107-114.

Theoretical examination of conditions necessary to permit continuity. Diagrams, graphs. 6 ref. (H12)

95-H. An Evaluation of Dissociated Ammonia and Hydrogen Atmospheres for Sintering Stainless Steel. Herbert S. Kalish and Edmund N. Mazza. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 304-310.

Nitrogen from dissociated ammonia enters the metal and causes embrittlement, increased hardness and slower sintering. Tables, micrographs, photograph. 17 ref. (H15, SS)

96-H. (English.) Natures of Activation Energies in Self-Diffusion and in Sintering and of Sublimation Energy of Copper. Mitsuru Sato. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 5, Oct. 1954, p. 458-461.

Studies of mechanism of sintering action of copper powder. Table. 9 ref. (H15, Ni, Cu)

97-H. (French.) Dilatometric Study of Sintering Carbonyl Iron in the Isothermal Condition. Georges Cizeron and Paul Lacombe. *Comptes rendus,* v. 240, no. 4, Jan. 24, 1955, p. 427-429.

Study at different sintering temperatures of the variation of density as a function of time using a Chevenard dilatometer. Graphs. 3 ref. (H15, Fe)

98-H. (German.) Studies on Grain Formation and Structure of Powders Produced by Dispersion of Molten Metals. E. Pelzel. *Metall,* v. 9, nos. 3-4, Feb. 1955, p. 81-88.

Effects of alloys on the condition of powders produced by spraying molten metal with compressed air through a nozzle. Micrographs, graphs, tables. 11 ref. (H10, M27, Fe, ST, Al, Cu, Pb, Sn, Zn, Ni, Mn)

99-H. (German.) Sintered Machine Parts. Gerhard Zapf. *VDI Zeitschrift,* v. 97, no. 4, Feb. 1, 1955, p. 89-96.

Equipment and methods; factors which influence the properties of sintered parts; effects of heat treating; molding practices; production costs. Photographs, diagrams, tables, graphs. 24 ref. (H general)

100-H. (Russian.) Obtaining Nickel Powders by Electrolysis. B. V. Drozdov. *Zhurnal Prikladnoi Khimii,* v. 28, no. 1, Jan. 1955, p. 45-51.

Experimental methods and theoretical discussion. Tables. 13 ref. (H10, Ni)

101-H. P.T.F.E.-Impregnated Dry Bearings. D. C. Mitchell and A. E. Burke. *Engineers' Digest,* v. 16, Feb. 1955, p. 53-58.

Methods of impregnating bronze bearings with polytetrafluorethylene. Testing procedures, performance of bearing. Tables, graphs, photographs, diagram, micrographs. 9 ref. (H16, Cu)

102-H. (German.) Problems of Structure in Hard-Alloy Phases. H. Nowotny. *Planseebericht für Pulvermetallurgie,* v. 1, no. 2, Feb. 1953, p. 43-60.

Relationship between lattice structure and hardness of different compounds; consideration of Hägg's theory on intercalation lattices. Diagrams, graphs. 33 ref. (H11, M26)

103-H. (German.) Bibliography. *Planseeberichte für Pulvermetallurgie,* v. 1, no. 2, Feb. 1953, p. 72-77.

Divided into various branches of powder metallurgy technology. (H general)

104-H. (Pamphlet.) Metal Powder Association, Proceedings of Tenth Annual Meeting. v. I-II. 116 p. 1954. Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.

Consists of nine papers on general powder metallurgy and five papers on properties and applications of powdered iron cores in electronic equipment. Papers are abstracted individually. (H general, P15)

J
Heat Treatment

57-J. Quenching Conditions. C. Wilson. *Aircraft Production,* v. 17, Feb. 1955, p. 72-79.

Temperature changes in large high-strength light-alloy specimens. Photographs, diagram, graphs, tables. (J general, Al)

58-J. Induction Heating Steel With 60 Cycles. C. D. Kramer. *Applications and Industry,* 1955, no. 16, p. 353-355; disc., p. 356-357.

Effect of steel size and shape on heating efficiency. Photographs, graphs. 4 ref. (J2, ST)

59-J. Control in Heat Treatment. J. G. Solomon. *Australasian Engineer,* 1954, Dec., p. 54-61.

Control of raw materials, heat treating processes and final inspection. Table, micrographs, graphs, photographs. 12 ref. (J general, ST)

60-J. Titanium and Zirconium Tubing Annealed in Vacuum Furnace. *Industrial Heating,* v. 22, Jan. 1955, p. 28 + 6 pages.

Electric, 24-ft. batch-type furnace suitable for metals which must be protected against atmospheric contamination. Photographs, tables. (J23, Ti, Zr)

61-J. Endothermic Atmosphere for Heat Treatment of Steel. R. J. Perrine. *Industrial Heating,* v. 22, Jan. 1955, p. 38 + 11 pages.

Quality of atmosphere depends on air-fuel ratio, temperature, detention time and activity of catalyst. Photographs, diagram, graphs, tables. (J2, ST)

62-J. Practical Applications of Dew Point Measuring and Control. O. E. Cullen. *Industrial Heating,* v. 22, Jan. 1955, p. 52 + 8 pages.

Evidence for better control of carbon potential by measuring water vapor rather than carbon dioxide. Graphs, table, diagram photograph. (J2)

63-J. Salt Bath Hardening of Tools. Elmer B. Hauser. *Metal Progress* v. 67, Feb. 1955, p. 96-98.

Case history reporting that the salt bath method has increased output, quality and economy in heat treatment of high speed toolsteels at Weldon Tool Co. Table, photographs, micrographs. (J2, TS)

64-J. Heat Treatment of Titanium Alloys. Leonard D. Jaffe. *Metal Progress,* v. 67, Feb. 1955, p. 101-108.

Examination of published data leads to systematic interpretation based on known properties of existing microconstituents and their changes during heat treatment. Tables, graphs. 12 ref. (J general, N general, Q general, Ti)

65-J. Standard H-Steels, 4032-H to 4150-H. *Metal Progress,* v. 67, Feb. 1955, p. 108-B.

Data sheet giving hardenability ranges for above steels. (J28, AY)

66-J. Don't Neglect the Quench! D. F. Hammer. *Steel Processing,* v. 41, Jan. 1955, p. 39-46, 48.

Metallurgical effects of quenching, requirements of the quench and ways of achieving these requirements. Graphs, micrographs, photograph. 3 ref. (J26, ST)

67-J. (German.) Effect of Structure on Flame Hardenability of Gray Cast Iron. Hans Wilhelm Grönegress. *Stahl und Eisen,* v. 75, no. 2, Jan. 27, 1955, p. 89-95.

Spheroidal graphite gives best response to surface hardening. Service experience. Tables, micrographs, graphs, photographs. 8 ref. (J2, M27, CI)

68-J. (Russian.) Case Hardening of Ferritic Malleable Cast Iron by High-Frequency Heating. M. O. Rabin and K. Z. Shepeliakovskii. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 10-12.

Equipment and technique. Microstructure after various periods of heating. Applications. Micrographs, photographs, drawings. (J2, M27, CI)

69-J. (Russian.) Furnaces for Annealing Malleable Cast Iron. N. V. Sadin. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 12-14.

Results of various time and temperature cycles in several furnaces. Graphs, tables. 4 ref. (J23, CI)

70-J. (Russian.) **Surface Hardening of Large-Size Crankshaft Journals, Using High-Frequency Current of a Low Specific Power for Heating.** G. M. Tel'nov and S. N. Sizov. *Vestnik Mashinostroenia,* v. 34, no. 12, Dec. 1954, p. 66-68.
Description of method; factors involved; optimum conditions for operation. Diagram, table. (J2)

71-J. Continuous Batch Type Annealing Furnace. Ralph H. Gelder and Walter E. Hand. *Iron and Steel Engineer,* v. 32, Feb. 1955, p. 107-111.
Equipment, specifications, operating procedures. Photographs, graphs. (J23)

72-J. Continuous Carbonitriding Setup Promotes Safety, Uniform Quality. R. J. Belz. *Iron Age,* v. 175, Feb. 17, 1955, p. 95-97.
Integration of atmosphere hardening furnaces with an automatic quench, wash and draw unit for steering gear components. Photographs. (J28, AY)

73-J. Induction Heating. D. Warburton-Brown. *Machinery Lloyd (Overseas Ed.),* v. 27, Feb. 12, 1955, p. 88 + 9 pages.
Theory, equipment, losses, applications. Diagrams, photographs, tables, graphs. (J2)

74-J. How to Avoid Heat Treating Difficulties Through Correct Design of Press Tools. Federico Strasser. *Metal Treating,* v. 6, Jan.-Feb. 1955, p. 2-4, 6, 8, 10; disc., p. 11.
Interdependence of heat treating and design in toolmaking. Diagrams, photographs. (J general, TS)

75-J. Application of Nitriding to Hot Forging Dies. Alexander F. Sherys. *Metal Treating,* v. 6, Jan.-Feb. 1955, p. 14, 16-17.
Improvements in die life by surface hardening. Photographs. (J28, F22, TS)

76-J. Heat Treating Titanium. Leo Schapiro. *Metal Treating,* v. 6, Jan.-Feb. 1955, p. 20-21.
Heat treating cycles for commercial titanium alloys. Photographs, graphs. (J general, Ti)

77-J. Cooperation Between the Heat Treater and the Steel Manufacturer. C. B. Post. *Metal Treating,* v. 6, Jan.-Feb. 1955, p. 24-27.
Problems in heat treating various toolsteels. Photographs, micrograph. (J general, ST)

78-J. Experiences With Commercial Gas Carburizing Equipment. H. C. Thomas. *Steel Processing,* v. 41, Feb. 1955, p. 115-121.
Equipment, operating procedures and results. Photographs, diagram, micrograph, graphs. (J28, ST)

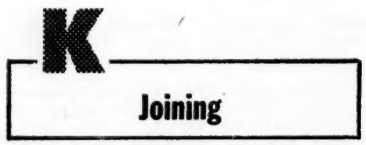
79-J. (German.) **Experiments on Relieving Internal Stresses Caused by Welding and Superposed Thermal Stresses.** K. Wellinger, Fr. Eichhorn, and Fr. Löffler. *Schweissen und Schneiden,* v. 7, no. 1, Jan. 1955, p. 7-14.
Annealing practice; measuring stresses and temperatures in test plates. Tables, graphs, diagrams. 5 ref. (J1, J23, K general, Q25, CN)

80-J. (German.) **Temperature Control of Electric Heat Treating Furnaces.** E. T. H. J. Horowitz. *Sprechsaal,* v. 88, no. 3, Feb. 5, 1955, p. 45-47.
Design and operation of various types of controls. Circuit diagrams, photograph. (To be continued.) (J general, S16)

81-J. (Swedish.) **Hardenability Test With Reference to Rapid Heating and Cooling Processes.** Tore Norén and Gerald Bini. *Svetsaren,* v. 19, nos. 2-3, 1954, p. 59-64.
Complement to the Jominy test which is more reproducible for determining weldability. Diagram, graphs, micrographs. 5 ref. (J26, K9, AY)

82-J. Heat Treatment of Ferrous Metals. *British Steelmaker,* v. 21, Feb. 1955, p. 50-58.
Features of recent installations in several British factories. Photographs, table. (J general, ST)

83-J Restore Surface Carbon in Sub-Critical and Over-Critical Anneal. J. D. Armour. *Iron Age,* v. 175, Feb. 24, 1955, p. 83-85.
Continuous annealing of cold drawn rod and wire in coils. Photographs, micrographs, tables. (J23, CN)



Joining

93-K. Brazing and Soldering by Induction Heating. E. S. Goodridge. *Industrial Heating,* v. 22, Jan. 1955, p. 64 + 6 pages.
Advantages include speed, efficiency, uniformity and quality. Photographs, diagram. (K8, K7)

94-K. Rubber-Base Adhesive Overcomes Tough Carbide Bonding Problem. B. L. Schrader. *Iron Age,* v. 175, Feb. 10, 1955, p. 94-96.
Bonding of carbide files to steel backings made possible. Photographs, diagram. (K12, CN, C-n)

95-K. Fortiweld, a New Development in Weldable High-Tensile Steel. II. H. F. Tremlett. *Welding and Metal Fabrication,* v. 23, Jan. 1955, p. 15-20.
Results of metal-arc, argon-arc and oxy-acetylene welding of this steel. Tables. (K1, K2, AY)

96-K. How to Arc Weld the Different Types of Stainless Steels. I. Lester F. Spencer. *Welding Engineer,* v. 40, Feb. 1955, p. 40-44.
Electrodes, methods and carbide precipitation in austenitic types. Photographs, tables. 8 ref. (K1, SS)

97-K. The Toughness of Weldability. William L. Warner. *Welding Journal,* v. 34, Jan. 1955, p. 9-22.
Appropriate evaluation of toughness factor facilitates selection of base metals, welding procedures and quality control tests. Photographs, diagrams, graphs, tables. (K9, ST)

98-K. A Production Application of Inert-Gas-Shielded Metal-Arc Welding of Mild Steel. John L. Lang. *Welding Journal,* v. 34, Jan. 1955, p. 23-29.
Cost and quality factors; control; influence of spatter, arc length, undercut, porosity and proper fixtures. Photographs, diagrams, charts, table. 3 ref. (K1, CN)

99-K. High-Temperature Alloy Brazing of Thin Materials for Jet Engines. Arnold S. Rose and William N. Lewis. *Welding Journal,* v. 34, Jan. 1955, p. 30-39.
Use of boron-nickel-chromium brazing alloy; precautions; applications. Photographs, graphs, micrographs, diagrams, table. 2 ref. (K8, Cr, Ni, SS, AY, CN)

100-K. Stainless Steel—Welding Summary. Helmut Thielsch. *Welding Journal,* v. 34, Jan. 1955, p. 22S-30S.
Effects of alloying elements on welding characteristics; recommendations for electrodes; heat treatments. Tables. 11 ref. (K general, J general, SS)

101-K. Weld Heat-Affected Zones in ½-In. Titanium Alloy Plates. Ernest F. Nippes, John M. Gerken and Bernard W. Schaaf. *Welding Journal,* v. 34, Jan. 1955, p. 31S-49S.
Notch toughness of two alloys as influenced by energy input, initial plate temperature and postheat treatments. Tables, photograph, graphs, micrographs. 4 ref. (K general, Q23, Ti)

102-K. (French.) **Progress Made in the Construction of Light-Alloy Tank Trucks by the Use of Argon-Arc Welding.** R. A. Boccon-Gibod. *Soudure et Techniques connexes,* v. 8, nos. 11-12, Nov.-Dec. 1954, p. 313-321.
Advantages of argon-arc welding. Diagrams, photographs, tables. (K1, Al)

103-K. (German.) **Procedures and Machines for Butt and Flash Welding.** Emil Wegmann. *Schweissen und Schneiden,* v. 6, no. 12, Dec. 1954, p. 494-499.
Procedures and equipment for welding large cross sections, using low-frequency current. Diagrams, photographs, graphs. (K3, ST)

104-K. Sigma Welding for Light Metals. Byron R. Russell. *Light Metal Age,* v. 12, Feb. 1955, p. 10-12, 28.
Advantages and disadvantages in current commercial practice. Photographs. (K1, Al)

105-K. How to Weld Some Wrought High Alloys. R. P. Culbertson. *Materials & Methods,* v. 41, Feb. 1955, p. 98-102.
Characteristics that must be considered in joint design and welding procedures. Tables, photographs, diagrams. (K general, Ni, Cr, Fe, Co, W, Mo)

106-K. Problems of Adhesion. B. V. Deryagin. *Research,* v. 8, Feb. 1955, p. 70-74. (Condensed from *Vestnik Akademii Nauk SSSR,* v. 7, 1954, p. 30.)
Research on mechanisms and principles of adhesives. Diagrams. 1 ref. (K12)

107-K. Significance of Recent Resistance Welding Research. J. E. Roberts. *Welding and Metal Fabrication,* v. 23, Feb. 1955, p. 64-69.
Developments in spot and projection welding of steel and aluminum. Tables, graph, diagrams, photographs. (To be continued.) (K3, ST, Al)

108-K. The Macro Etch System of Evaluating Quality of Resistance Welding. D. O. Samuelson and F. G. Harkins. *Welding Journal,* v. 34, Feb. 1955, p. 105-111.
Nondestructive testing technique for quality control of stainless steel spot welds. Photographs, tables, graphs, micrographs. (K3, K9, SS)

109-K. Properties of Welds in Al-Mg-Mn Alloys 5083 and 5086. L. A. Cook, S. L. Channon and A. R. Hard. *Welding Journal,* v. 34, Feb. 1955, p. 112-127.
Welding characteristics and mechanical and physical properties of weld joints. Photographs, tables, graphs. 11. ref. (K general, Q general, P general, Al, Mg, Mn)

110-K. New Techniques in Inert-Gas-Shielded Metal-Arc Welding. R. W. Tuthill. *Welding Journal,* v. 34, Feb. 1955, p. 137-141.
Techniques for using carbon dioxide as a shielding atmosphere. Photographs, graph, diagram. 5 ref. (K1, CN)

111-K. Brazing Molybdenum for High-Temperature Service. M. I. Jacobson and D. C. Martin. *Welding Journal,* v. 34, Feb. 1955, p. 65S-74S.
Techniques for producing joints for high-temperature service. Tables, graphs, diagrams, photographs, micrographs. (K8, Mo)

112-K. Direct Explosion Tests of Welding Procedures in Ship Plate. G. S. Mikhalapov and W. A. Snelling. *Welding Journal*, v. 34, Feb. 1955, p. 97S-104S.

Data for welds in semi-killed and rimmed steels. Tables, graphs, photograph. 6 ref. (K9, CN)

113-K. (French.) Study of the Weldability of 37 H. S. Steels. Test Results. J. Massinon. *Revue de la soudure (Brussels)*, v. 10, no. 4, 1954, p. 216-228.

Elastic limit, brittle fracture and aging of eight steel castings. Tables, graphs, diagrams, photographs. (K9, CI)

114-K. (German.) Welding in Steel Structure. A. Battig. *Schweisstechnik*, v. 8, no. 11, Nov. 1954, p. 121-127.

Types of welding with special emphasis on bridges. Photographs, drawings. (K general, ST)

115-K. (Spanish.) Problem of Fracture During Arc Welding of Alloy Steels. F. Donis Ortiz. *Ciencia y técnica de la Soldadura*, v. 4, no. 20, Sept.-Oct. 1954, 16 p.

Metallographic structures and use of electrodes; preparation of joints; preheating and heat treatment. Graphs, tables, photographs. (To be continued) (K1, J general, AY)

116-K. (Swedish.) Effects of Electrode Properties on Welding Costs. E. J. Magnusson. *Svetsaren*, v. 19, nos. 2-3, 1954, p. 23-31, 34-39.

Effects of fusion coefficient, deposition efficiency and amperage on welding speed; formulas for comparing electrodes. Graphs, diagrams, photograph, tables. 13 ref. (K1)

117-K. (Swedish.) Application of TTT-Diagrams to Determination of Welding Conditions of Hardenable Structural Steel. Lauri Pietilainen. *Svetsaren*, v. 19, nos. 2-3, 1954, p. 50-58.

Post-heating cycles for welds in alloy steels. Graphs, table, photograph, micrographs. 5 ref. (K9, N8, AY)

118-K. Welded Structure for the Hunstanton Secondary Modern School. G. H. Smith. *British Welding Journal*, v. 2, Feb. 1955, p. 49-55.

Welding problems in construction of building framework. Diagrams, photographs. (K general, CN)

119-K. Fusion Welding of Aluminium Alloys. VII. Recording Porosity in Aluminium-Alloy Welds. P. T. Houldcroft and A. A. Smith. *British Welding Journal*, v. 2, Feb. 1955, p. 67-74.

Severity of porosity classification system. Micrographs, diagrams, tables. (K9, Al)

120-K. Weldability of a C-Mn Steel Related to Properties of the Heat-Affected Zone. C. L. M. Cottrell. *British Welding Journal*, v. 2, Feb. 1955, p. 75-80; disc., p. 80.

Effects of temperature and cooling rates on mechanical properties of the heat affected zone. Graphs, tables, micrographs. 10 ref. K9, Q general, AY)

121-K. Mineral Use in Coated Welding Electrodes. Richard M. Stewart. *California Journal of Mines and Geology*, v. 51, Jan. 1955, p. 9-19.

Function of rutile, limestone and other minerals in coatings. Availability and prospects for use of new minerals. Photographs, tables, diagram. 4 ref. (K1)

122-K. Joints Brazed With New Nickel-Base Alloys Exhibit Good Properties. C. V. Foerster and R. C. Kopituk. *Iron Age*, v. 175, Feb. 24, 1955, p. 79-82.

Mechanical properties and corrosion resistance of brazing alloys for heat resistance metals. Table, photographs, graphs. (K8, Q general, R general, Ni, Si, Cr, B)

123-K. How to Arc Weld the Different Types of Stainless Steels. II. Lester F. Spencer. *Welding Engineer*, v. 40, Mar. 1955, p. 32-34.

Effects of welding procedures on structure and properties of ferritic and martensitic types. Photograph, table. 8 ref. (K1, SS)

124-K. Progress in "Koldweld!ng". W. A. Barnes. *Wire and Wire Products*, v. 30, Feb. 1955, p. 179, 218-220.

Applications of cold welding of aluminum and copper; production tools. Diagrams. (K5, Al, Cu)

125-K. (Book.) Adhesion and Adhesives. Fundamentals and Practice. 229 p. 1954. Society of Chemical Industry, 56 Victoria St., London, S.W.1, England. $9.75; John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y.

With the art of adhesion far ahead of the science, 43 papers are presented to show the advancements being made in both cases, with the primary objective of discussing the status of basic knowledge. (K12)

L
Cleaning, Coating and Finishing

188-L. Ceramic Coatings for Nuclear Reactors. A Progress Report. Joseph C. Richmond, Henry G. Lefort, Charles N. Williams and William N. Harrison. *American Ceramic Society, Journal*, v. 38, Feb. 1955, p. 72-80.

Study of coatings having low absorption coefficients for thermal neutrons. Designed for application to typical high-temperature alloy parts. Tables, micrographs, graphs. 45 ref. (L27)

189-L. Turbine Blades Clad by Rapid Series-Arc Welding. *Canadian Metals*, v. 18, Feb. 1955, p. 41.

Quickly deposited layer of stainless steel on areas of cast steel blades subjected to wear and corrosion, provides good protection. Photographs. (L24, CI, SS)

190-L. Acid-Truck Painting Cost Cut 85%. *Chemical Engineering*, v. 62, Feb. 1955, p. 218, 220, 222.

Use of neoprene coatings permits lower painting costs, less layup or downtime of tank, longer tank life. Photographs. (L26, R5)

191-L. Determination of Plating Quality. G. Howells. *Corrosion Technology*, v. 2, Jan. 1955, p. 9-12.

Methods of testing for adhesion, porosity, hardness and luster. Tables, diagrams. (L17)

192-L. Deposition of Titanium Coatings From Pyrosols. A. W. Schlechten, M. E. Straumanis and C. B. Gill. *Electrochemical Society, Journal*, v. 102, Feb. 1955, p. 81-85.

Protective titanium films can be deposited on copper and iron in molten salt baths. Mechanism of the titanium transfer. Graphs, micrographs. 8 ref. (L14, Ti, Cu, Fe)

193-L. Advances in Stannate Tin Plating—the Potassium Stannate Bath. J. W. Cuthbertson. *Industrial Finishing (London)*, v. 8, Jan. 1955, p. 21-24, 26-27.

Compares sodium with potassium tin plating; applications. Photographs, diagrams, graph, table. 11 ref. (L17, Sn)

194-L. Cold Cleaners Do Effective Job in Still and Spray Tanks. James McElgin. *Iron Age*, v. 175, Feb. 3, 1955, p. 110-112.

Two new cold cleaners, used in combination, effectively remove shop oil and dirt without producing toxic or disagreeable fumes. Photograph, diagrams. (L12)

195-L. Ten Years of Mechanical Descaling of Hot Rolled Steel Products. Gilbert D. Dill. *Iron and Steel Engineer*, v. 32, Jan. 1955, p. 85-89.

Main applications of mechanical blast cleaning. Photographs. (L10, ST)

196-L. Coatings on Molybdenum. Walter Beck. *Metal Industry*, v. 86, Jan. 21, 1955, p. 43-46.

Electrolytic deposition of aluminum, silicon and boron from fused salt baths. Micrographs, graphs, table. 4 ref. (L17, Al, Si, B, Mo)

197-L. The Use of Filters in Electroplating. J. B. Mohler and Charles E. Crowley. *Metal Finishing*, v. 53, Feb. 1955, p. 52-57, 60.

Types of filters and practices for various plating baths. Diagrams, tables. (L17)

198-L. Alkali Metals in Phosphating and Cyanide Plating Baths. Determination by Means of Anion Exchangers. Gunnar Gabrielson. *Metal Finishing*, v. 53, Feb. 1955, p. 58-60.

Analytical procedure. Tables. 7 ref. (L14, L17)

199-L. Anodizing Hollow Objects. William McNeill. *Metal Finishing*, v. 53, Feb. 1955, p. 61-62.

Use of bipolar electrodes to anodize internal surfaces of aluminum and magnesium objects. Graph, diagram, table, photographs. 2 ref. (L19, Al, Mg)

200-L. Surface Treatment and Finishing of Light Metals. V. Chemical Conversion Coatings. S. Wernick and R. Pinner. *Metal Finishing*, v. 53, Feb. 1955, p. 66-72.

Protective values of various coatings on aluminum. Tables, graphs. 21 ref. (L14, Al)

201-L. Electrostatic Finishing of Appliances. *Metal Progress*, v. 67, Feb. 1955, p. 84-86.

Highly mechanized finish line for domestic laundry cabinets. Photographs. (L26)

202-L. Production Plating of Magnesium Die Castings. Leo D. Goddeyne and Dennis J. Goddeyne. *Precision Metal Molding*, v. 13, Feb. 1955, p. 59-60, 62-63.

Procedures for development of a chromium finish. Photograph. (L17, Mg, Cr)

203-L. Notes on Electroplating Metallized Surfaces. Samuel Wein. *Products Finishing*, v. 19, Feb. 1955, 24 + 6 pages.

Materials and methods for plating of copper, nickel, iron, gold and silver. Tables. (L17, Cu, Fe, Ni, Au, Ag)

204-L. Evaluation of Aluminum Cleaners for Resistance Welding. W. B. Stephenson, Jr. *Steel Processing*, v. 41, Jan. 1955, p. 31-33.

Comparison of proprietary cleaners shows that overprocessing may be objectionable. Photographs, graphs. (L10, K3, Al)

205-L. Some Aspects of the Electrodeposition of Titanium and Zirconium Coatings. R. M. Creamer, D. H. Chambers and C. E. White. *U. S. Bureau of Mines, Report of Investigations* 5093, Dec. 1954, 39 p.

Developments in use of aqueous, nonaqueous, and fused-salt electrolytes. Tables. 28 ref. (L17, Ti, Zr)

206-L. High Nickel Overlays on Ferrous Metals. G. R. Pease, H. B.

Bott and H. C. Waugh. *Welding Journal*, v. 34, Jan. 1955, p. 40-48.

Effects of iron dilution on mechanical properties of high-nickel alloys deposited on steel; control of arc-welding process. Photographs, tables, diagram. 1 ref.
(L24, K1, Q general, Ni, CN)

207-L. Intensified Attack of Molten Zinc on Iron at About 930° F. D. Horstmann. *Henry Brutcher Translation no.* 3290, 9 p. Henry Brutcher, Altadena, Calif. (Slightly abridged from *Archiv für das Eisenhüttenwesen*, v. 25, nos. 5-6, 1954, p. 215-219.)

Previously abstracted from original. See item 680-L, 1954.
(L16, Fe, Zn)

208-L. Mechanism of Electrodeposition of Chromium. A. I. Levin, A. I. Falicheva, E. A. Ukshe and N. S. Brylina. *Henry Brutcher Translation no.* 3315, 8 p. Henry Brutcher, Altadena, Calif. (From *Doklady Akademii Nauk SSSR*, v. 95, no. 1, 1954, p. 105-108.)

Previously abstracted from original. See item 501-L, 1954. (L17, Cr)

209-L. On the Theory of the Deposition of Chromium From Aqueous Chromic Acid Solutions. I-II. E. Müller. *Henry Brutcher Translation nos.* 3320-3321, 33 p. (From *Archiv für Metallkunde*, v. 2, no. 4, 1948, p. 110-120.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 8-161, 1949. (L17, Cr)

210-L. Attack of Iron-Saturated Molten Zinc on Iron as Affected by an Antimony Content. D. Horstmann. *Henry Brutcher Translation no.* 3407, 11 p. (Slightly abridged from *Archiv für das Eisenhüttenwesen*, v. 25, nos. 5-6, 1954, p. 207-213.) Henry Brutcher, Altadena, Calif.

Antimony is an undesirable addition to the zinc bath and large quantities only serve to widen the temperature range of attack. Tables, graphs, micrographs. 6 ref.
(L16, Sb, Zn, Fe)

211-L. Absorption of Hydrogen by Austenitic Steels Under Cathodic Loading. F. Eisenkolb and G. Ehrlich. *Henry Brutcher Translation no.* 3412, 24 p. (Slightly abridged from *Archiv für das Eisenhüttenwesen*, v. 25, nos. 3-4, 1954, p. 187-194.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 492-L, 1954. (L17, AY)

212-L. Deposition of Bright Nickel Plates From Ammoniacal Solutions. N. A. Izgaryshev, N. T. Kudryavtsev and E. V. Morozov. *Henry Brutcher Translation no.* 3423, 5 p. (From *Doklady Akademii Nauk SSSR*, v. 96, no. 1, 1954, p. 143-144.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 636-L, 1954. (L17, Ni)

213-L. (French.) Weld Deposition and Its Applications in Industry. Adolphe Luthy. *Métallurgie et la construction mécanique*, v. 86, no. 12, Dec. 1954, p. 945-947, 949-951.

Techniques, possibilities and various uses. Photographs.
(L24, Cr, W, Ni, Co, V)

214-L. (French.) Electrodeposits of Zinc. *Métallurgie et la construction mécanique*, v. 86, no. 12, Dec. 1954, p. 967, 969.

Use of alkaline baths; preparation of pieces; operation of bath.
(L17, Zn)

215-L. (German.) Pickling Thin Sheet Metals Under the Influence of Sonic Energy. W. Meiswinkel. *VDI Zeitschrift*, v. 97, no. 2, Jan. 11, 1955, p. 42-46.

Reduction of pickling time and acid consumption by subjecting sheet metals to sonic frequencies. Diagrams, tables, photographs, graphs. 24 ref. (L12, Fe, ST)

216-L. (Russian.) Chemical Nickel Coating. S. M. Panchenko and M. A. Krokhina. *Vestnik Mashinostroeniia*, v. 34, no. 12 Dec. 1954, p. 68-70.

Theoretical bases of method; practical applications; optimum conditions; comparison with electrolytic deposition process. Graphs, tables. 3 ref. (L14, Ni)

217-L. Suggested Guide to Laboratory Metal Cleaning. J. C. Harris, W. Stericker and S. Spring. *ASTM Bulletin*, 1955, no. 204, Feb., p. 31-34.

Soils, cleaning agents, procedures. Tables. 3 ref. (L12)

218-L. Use of Cast-Iron Ground-Coats. P. Rogers. *Foundry Trade Journal*, v. 98, Feb. 3, 1955, p. 121-123.

Various types of enamel bases.
(L27, CI)

219-L. Polishing of Metal by the Barrelling Process. L. Mable. *Institute of Metal Finishing, Bulletin*, v. 4, Winter 1954-1955, p. 289-298.

Equipment and processes for deburring, cleaning and polishing. Photograph. (L10)

220-L. Molybdenum Deposition on Titanium. Sam Tour, Andre Styka and George Fischer. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Feb. 1955, p, 291-296.

Hard, adherent and wear-resistant coatings are vapor deposited without changing microstructure of the titanium. Diagram, tables, micrographs. 4 ref. (L25, Mo, Ti)

221-L. New Solution Ceramic Coatings. Kenneth Rose. *Materials & Methods*, v. 41, Feb. 1955, p. 107-108.

Water solutions (not suspensions) of metallic salts are sprayed followed by warming sufficiently for drying. Coating resists heating and corrosion. Photographs. (L27)

222-L. Bumper Guards. Processing Know-How Results in Superior Finished Product. Max Weinberg and Al Lake. *Plating*, v. 42, Feb. 1955, p. 144-146, 159, 179.

Interdependence of drawing, polishing and plating processes in obtaining a good finish. Photographs.
(L17, G4, CN)

223-L. The Plating of Powder-Metallurgy Bronze Parts. E. V. Raymond, R. T. Foley, and W. L. Chu. *Plating*, v. 42, Feb. 1955, p. 150-151.

Oil impregnation before plating found beneficial in producing a good tin plate on sintered bronze. Micrographs. 6 ref.
(L17, H16, Cu, Sn)

224-L. The Influence of the Physical Metallurgy and Mechanical Processing of the Basic Metal on Electroplating. I. Critical Review of the Literature. A. E. R. Westman and F. A. Mohrnheim. *Plating*, v. 42, Feb. 1955, p. 154-158, 195.

Influence of steel properties on characteristics of electrodeposited nickel-chromium coatings. Diagrams. 75 ref. (L17, ST, Ni, Cr)

225-L. Cures for Faults in Electroplating. Zinc Plating Troubles. J. H. Collins. *Product Finishing*, v. 7, Sept. 1954, p. 50-54.

Problems and their recommended cures in acid zinc and cyanide zinc plating. Tables. (L17, Zn)

226-L. The Use of Melamine Resins in Organic Protective Coatings. I. Greenfield. *Product Finishing*, v. 7, Sept. 1954, p. 61-68.

Melamine properties, production methods, formulation, advantages, application methods and uses. Photographs, structural formulas.
(L26)

227-L. Correct Abrasive Selection in Blast Cleaning Metals. V. F. Stine. *Steel Processing*, v. 41, Feb. 1955, p. 100-103.

Characteristics of various abrasive materials, equipment factors, important uses. Tables, photographs. (L10)

228-L. (French.) Experimental Study and Control of Enamel-Metal Adherence. Application to Aeronautical Construction Steels and to Their Ceramic Protection. S. J. Tonachella. *Metaux, Corrosion-Industries*, v. 29, no. 352, Dec. 1954, p. 483-509.

Results of adherence tests, influence of metal surface state, influence of different alloys, dilatometrics of metallic and ceramic materials, influence of additions, tests on refractory alloys. Tables, graphs. 39 ref.
(L27, CN, Ni, AY, Cr, Co, Ti, W)

229-L. (German.) Corrosion Protection of Pure Al, Riffinal and Reflektal. D. Altenpohl. *Aluminium*, v. 31, no. 2, Feb. 1955, p. 62-69.

Chemical resistance of various oxide films, method of producing Böhmite films. Tables, graphs. 21 ref. (L14, Al)

230-L. (German.) Conditions of Deposition and Structure of Compact Electrolytic Nickel Deposits in the Range of the FT and UD Type. J. Elze. *Metall*, v. 9, nos. 3-4, Feb. 1955, p. 104-109.

X-ray and metallographic studies of the effect of electroplating conditions on the structures of nickel deposits. Tables, micrographs, graphs. 14 ref. (L17, M27, Ni)

231-L. (German.) Economical Pickling in Theory and Practice. A. Pollack. *Metalloberfläche*, Ausgabe A, v. 9, no. 2, Feb. 1955, p. 17-22.

Review of literature on methods and equipment. Photographs. 51 ref.
(L12)

232-L. (German.) Patents on Chemical and Electrochemical Polishing and Brightening of Metal Surfaces Since 1940. Hermann Baur. *Metalloberfläche*, Ausgabe A, v. 9, no. 2, Feb. 1955, p. 22-28.

Patent numbers, dates, polishing solutions, additives, polishing temperatures and currents for polishing ferrous and nonferrous metals and alloys. Tables. (L12, L13)

233-L. (German.) Comparative Investigations of Layer-Thickness Measuring Processes. Herbert Barghoorn. *Metalloberfläche*, Ausgabe B, v. 7, no. 2, Feb. 1955, p. 20-25.

Destructive and nondestructive methods of measuring the thicknesses of deposits on metals; sources of error. Diagrams, tables, graph. (To be continued) (L17, S14)

234-L. (German.) Chemical or Mechanical Descaling of Steel Bars? Otto Peltzer. *Stahl und Eisen*, v. 75, no. 3, Feb. 10, 1955, p. 129-140.

Cost comparisons of shot blasting versus pickling. Photographs. diagrams. 20 ref. (L10, L12)

235-L. (German.) Chemical Process of Descaling Stainless and Heat Resisting Steel Without the Use of Acids. Berthold Wenderott. *Stahl und Eisen*, v. 75, no. 3, Feb. 10, 1955, p. 141-144.

Method consists of treating in salt bath, followed by annealing in reducing atmosphere. Effects of treatment on corrosion and heat resistance. Table, graph, micrographs. 4 ref. (L12, S8)

236-L. (German.) Several Problems of the Process of Polishing Aluminum and Aluminum Alloys. F. Baumann. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 8, no. 1, Jan. 1955, p. 14-18.

Mechanism and controls of anodic and chemical polishing processes, effect of ion concentration in polishing bath, importance of composition of metal to polishing operation. Graphs. 9 ref. (L12, L13, Al)

237-L. (German.) **The Growth of Thin Films.** G. Cario and J. H. Kallweit. *Zeitschrift für Physik,* v. 140, no. 1, 1955, p. 47-56.

Factors which influence the properties of vapor-deposited films. Micrographs, diagram, graphs. 11 ref. (L25, Au)

238-L. (Russian.) **Mechanism of the Influence of Alkaline Metal Ions on the Process of Electrodeposition of Copper.** R. M. Vasenin and S. V. Gorbachev. *Zhurnal Fizicheskoi Khimii,* v. 28, no. 12, Dec. 1954, p. 2156-2169.

Relation of cathode polarization and current density to coefficient of electron polarization of cations. Graphs, table. 22 ref. (L17, Cu, Ni)

239-L. (Spanish.) **New Studies of the Metallizing Processes.** A. Matting. *Ciencia y técnica de la Soldadura,* v. 4, no. 20, Sept.-Oct. 1954, 14 p.

Processes taking place at the tip of wire, formation and acceleration of particles in alloys, the metallized coating. Photographs, drawings, diagrams, graphs, micrographs. 7 ref. (L23)

240-L. Chemical Nickel Plating Comes to the Fore. *Chemical Engineering,* v. 62, Mar. 1955, p. 220, 222.

Excellent, even plates formed. Photograph, flowsheet. (L17, Ni)

241-L. Metallizing for Corrosion Prevention. A. P. Shepard and R. J. McWaters. *Corrosion,* v. 11, Mar. 1955, p. 115-118; disc., p. 118.

Problems and techniques connected with spraying of molten metal on iron and steel. (L23)

242-L. Productivity and Cost Control in Metal Finishing. I. Influence of Product Design for Electroplating. F. C. Ashford. *Electroplating and Metal Finishing,* v. 8, Feb. 1955, p. 50-53.

Design considerations for economical plating and polishing operations. Diagrams, photographs. (L17)

243-L. Throwing Power of Complex Copper Electrolytes. I. Solutions Containing Ethanolamines. A. V. Izmaylov and S. V. Gorbachev. *Electroplating and Metal Finishing,* v. 8, Feb. 1955, p. 54-57. (Translated from *Zhurnal Fizicheskoi Khimii,* v. 28, no. 2, Feb. 1954, p. 229-239.)

Previously abstracted from original. See item 528-L, 1954. (L17, Cu)

244-L. Adhesion and Surface Preparation in Protective Metal Spraying. III. Industrial Grit Blasting Machines. J. M. Cowan. *Electroplating and Metal Finishing,* v. 8, Feb. 1955, p. 67-72.

Comparison of compressed air and centrifugal equipment. Photographs, diagram. 4 ref. (L10)

245-L. High-Production Line Deposits Quality Chrome Plate on Bumpers. Herb Chase. *Iron Age,* v. 175, Mar. 3, 1955, p. 115-118.

Equipment and operation of highly mechanized installation. Photographs. (L17, Cr, Cu, CN)

246-L. Electrolytic Salt Baths Descale Hot and Cold-Rolled Stainless Strip. T. J. Nolan and G. E. Rowan. *Iron Age,* v. 175, Mar. 3, 1955, p. 119-121.

Continuous annealing and pickling at Atlas Steels, Ltd. Photograph, flowsheet. (L12, J23, SS)

247-L. Automatic Control Permits Plating Cell Selection. T. J. Doyle. *Machinery,* v. 61, Mar. 1955, p. 180-187.

Operation of plating machine. Automobile bumpers are automatically shifted between adjacent plating cells and tanks. Table, diagrams, photographs. (L17)

248-L. Hot Dip Galvanizing Is a Science. I. Wallace G. Imhoff. *Wire and Wire Products,* v. 30, Feb. 1955, p. 167-170, 233-235.

Scientific principles of producing high-quality coatings at lowest cost. Photograph, tables, graph. (L16, Zn)

249-L. (Russian.) **Investigation of the Electropolishing Process for Metals.** P. V. Shchigolev and N. D. Tomashov. *Doklady Akademii Nauk SSSR,* v. 100, no. 2, Jan. 11, 1955, p. 327-330.

Current density, polarization curves, anodic passivity phenomenon. Graphs, diagrams. 14 ref. (L13, Cu, Ni, Zn)

250-L. (Pamphlet.) **Electrodeposition of Titanium and Zirconium.** Robert M. Creamer, David H. Chambers and Charles E. White. U. S. Department of Commerce, Office of Technical Services, PB 111525, Dec. 1953, 27 p.

Of aqueous, nonaqueous and fused electrolytes tried, only a fused system of potassium chloride-lithium chloride-titanium(III) chloride gave weighable plates on iron, nickel and copper. Tables. 18 ref. (L17, Ti, Zr, Fe, Ni, Cu)

251-L. (Pamphlet.) **Methods of Vapor Deposited Coatings for Titanium and Titanium Alloys.** Report PB111533. 29 p. 1952. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.75.

Deposition of molybdenum by decomposition of molybdenum hexacarbonyl; hardness of coatings. Tables, charts, photographs, micrographs. (L25, Mo, Ti)

252-L. (Pamphlet.) **Methods of Vapor Deposited Coatings for Titanium and Titanium Alloys.** Report PB111534. 29 p. 1953. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.75.

Wear resistant molybdenum coating; data for bend and wear tests; plating procedures. Tables, charts, micrographs, diagram. (L25, Mo, Ti)

M

Metallography, Constitution and Primary Structures

79-M. An Apparatus for Electropolishing Specimens for Metallographic Examination. E. C. Sykes, V. J. Haddrell, H. R. Haines and B. W. Mott. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 166-168.

Low-cost unit which produces specimens completely free of flow lines caused by gas bubbles. Diagrams. 6 ref. (M21)

80-M. The Constitution of Aluminium-Rich Alloys Containing Copper, Manganese and Silicon. A. P. Bagchi and H. J. Axon. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 176-180.

Metallographic study of chill-cast specimens annealed at 460° C. for 21 days. Graphs. 15 ref. (M24, Al, Cu, Mn, Si)

81-M. A Study of the Behaviour of Titanium-Rich Alloys in the Titanium-Tin and Titanium-Aluminium Systems. A. D. McQuillan. *Institute of Metals, Journal,* v. 83, Jan. 1955 p. 181-184.

Effects of aluminum and tin on the alpha ⇄ beta transformation in titanium studied by the hydrogen pressure method. Graphs. 10 ref. (M24, N6, Ti, Al, Sn)

82-M. Useful Microscopic Techniques. (Digest of "Progress in Metallurgical Microscopy", by B. W. Mott; *Endeavor,* v. 12, July 1953, p. 154-161.) *Metal Progress,* v. 67, Feb. 1955, p. 168, 170, 172.

Improvements in accessories and practices. (M21)

83-M. Photographing Stretcher-Strain Markings With the Vickers Projection Microscope. T. D. Boxall and B. B. Hundy. *Metallurgia,* v. 51, no. 303, Jan. 1955, p. 52-54.

Illumination technique for magnifications of 3 to 15X. Photographs, micrographs, diagrams. (M21, CN)

84-M. On the Structure of the Carbide Phases of Vanadium. M. A. Gurevich and B. F. Ormont. *Henry Brutcher Translation no.* 3414, 8 p. (From *Doklady Akademii Nauk SSSR,* v. 96, no. 6, 1954, p. 1165-1168.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 331-M, 1954. (M26, V)

85-M. (French.) **Spiral Substructure in an Aluminum Beta-Gamma-Brass.** Pierre A. Jacquet. *Comptes rendus,* v. 239, no. 25, Dec. 20, 1954, p. 1799-1801.

Electropolishing reveals figures very comparable to those found on growth faces of various mineral crystals. Micrographs. 4 ref. (M27, Al, Cu)

86-M. (French.) **Interpretation of Spiral Substructures Observed in Aluminum Beta-Gamma-Brass.** Adrienne R. Weill and Pierre A. Jacquet. *Comptes rendus,* v. 239, no. 25, Dec. 20, 1954, p. 1801-1803.

Spirals observed result from a precipitation obeying a mechanism imposed by the assemblage of solute atoms and dislocations. 6 ref. (M26, Al, Cu)

87-M. (French.) **New Precision Chamber for Studying the Parameter of Alloys With Structural Hardening.** R. Graf. *Recherche Aéronautique,* 1954, no. 42, Nov.-Dec., p. 51-54.

Precision chamber for X-ray study of crystalline lattice; source and elimination of errors. Diagrams, photograph. 6 ref. (M26)

88-M. (French.) **Some Aspects of Oxidation of Iron at High Temperature and Low Oxygen Pressures Leading to a Micrographic Method for the Study of Gamma Iron Structure.** J. Bardolle. *Revue de métallurgie,* v. 51, no. 12, Dec. 1954, p. 833-837; disc., p. 837-838.

The number of protoxide nuclei is different for each crystallographic plane. Possibility of studying alpha ⇄ gamma transformations by this technique. Micrographs, diagram. 3 ref. (M23, M26, N6, Fe)

89-M. (German.) **Regularities in Electron-Refraction Recordings of Antimony Films With Texture.** Ulrich Zorll. *Zeitschrift für Physik,* v. 139, no. 5, 1954, p. 649-653.

Textures of thin vapor-deposited antimony revealed by irradiation with fast electrons. Diagrams, refractograms. 3 ref. (M23, Sb)

90-M. (German.) **Lattice Constants and Texture of Thin Indium Films.** U. Zorll. *Zeitschrift für Physik,* v. 139, no. 5, 1954, p. 654-657.

Determined with aid of lithium fluoride grid and obliquely incident electron beams. Interferograms, graph. 5 ref. (M26, In)

91-M. (Russian.) **Problem of the Use of Photoelements in the Metallographic Investigation of Cast Iron.** E. I. Egorov and Iu. S. Romashin. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 22-23.

Equipment for more precise study of microstructure. Micrographs, diagrams, graph, table. (M27, M21, CI)

92-M. A Microscopical Examination of Samples of Iron Containing Siliceous Inclusions. R. E. Lismer and F. B. Pickering. *Iron and Steel Institute, Journal,* v. 179, Feb. 1955, p. 159-162 + 1 plate.

Means of positive identification of inclusions. Tables, micrographs. 4 ref. (M21, Fe)

93-M. Microstructures of Pyrophoric Alloys. R. D. Reiswig and David J. Mack. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 315-316.

Study of cerium-base alloys shows that best structure for lighter flints is a pyrophoric matrix with dispersed hard particles. Micrographs. (M27, Ce, Fe, Mg, Bi)

94-M. A Study of the Microstructure of Titanium Carbide. Herman Blumenthal and Ronald Silverman. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 317-322.

Influence of microstructure of titanium carbide on properties of cermets. Explanation of "coring effect". Tables, micrographs. 11 ref. (M27, H general, Ti, C-n)

95-M. High-Temperature Vacuum Etching on Pure Titanium. W. D. Bennett. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 322.

High-temperature etching without contamination or increase in hardness. Micrographs. 2 ref. (M21, Ti)

96-M. Vanadium-Zirconium Alloy System. J. T. Williams. *Journal of Metals,* v 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 345-350.

Equilibria investigated by six techniques. Tables, diagrams, graphs, micrographs. 9 ref. (M24, V, Zr)

97-M. Gallium-Antimony System. I. G. Greenfield and R. L. Smith. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 351-353.

Thermal, X-ray and metallographic data. Diagram, graph, micrographs. 6 ref. (M24, Ga, Sb)

98-M. Magnesium-Rich Corner of the Magnesium - Lithium - Aluminum System. J. A. Rowland, Jr., C. E. Armantrout and D. F. Walsh. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 355-359.

Data from metallographic and X-ray studies. Micrographs, graphs. 11 ref. (M24, Mg, Li, Al)

99-M. Preliminary Investigation of the System Ti-Mg. J. W. Fredrickson. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 368.

Metallographic and X-ray studies show no compounds up to 1.5% magnesium. (M24, Ti, Mg)

100-M. Some Aspects of the Crystallization and Recrystallization of Vapor-Deposited Vitreous Selenium. N. E. Brown and F. L. VerSnyder. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955 p. 379-381.

Microstructural changes as function of heat treatment; mode of hexagonal recrystallization. Micrographs. 3 ref. (M27, N5, N12, Se)

101-M. Cellular Structure in High Purity Zinc. R. P. Steijn. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 406-407.

Observations on prismatic structure of 99.99% pure zinc. Micrographs. 6 ref. (M26, Zn)

102-M. Crystal Structure of Neodymium Metal. F. H. Ellinger. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 411.

X-ray diffraction data. Table. 3 ref. (M26, Nd)

103-M. Sigma Phase in the Molybdenum-Ruthenium System. D. S. Bloom. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 420.

X-ray diffraction data show sigma phase is stable only above 1200° C. and exists only in a narrow composition range. Table. (M26, M24, Mo, Ru)

104-M. The Relation of Definition to Sharpness and Resolving Power in a Photographic System. George C. Higgins and Robert N. Wolfe. *Optical Society of America, Journal,* v. 45, Feb. 1955, p. 121-129.

Factors influencing quality of photographic negatives. Graphs, diagrams, photographs, table. 7 ref. (M21)

105-M. Dynamics of Simple Lattices. Herbert B. Rosenstock. *Physical Review,* v. 97, ser. 2, Jan. 15, 1955, p. 290-303.

Position and nature of singularities in frequency distribution for second-nearest and nearest neighbors. Graphs, tables, diagrams. 23 ref. (M26)

106-M. Energy Levels of a Disordered Alloy. R. H. Parmenter. *Physical Review,* v. 97, ser. 2, Feb. 1, 1955, p. 587-598.

Application of perturbation theory to crystal structure determination. Graphs, diagrams. 11 ref. (M26, N10)

107-M. Lamellar Defects in Single Crystals of Silicon. J. Franks, G. A. Geach and A. T. Churchman. *Physical Society, Proceedings,* v. 68, no. 422B, Feb. 1955, p. 111-112.

Structural defects lying on (111) and (123) planes. Similar lamellae may be introduced by plastic deformation. 3 ref. (M26, Q24)

108-M. Recent Developments in Electron Microscopy. V. E. Cosslett. *Research,* v. 8, Feb. 1955, p. 48-56.

Developments in lens design, specimen preparation, potential applications. Diagram, photographs, micrographs. 51 ref. (M21)

109-M. Single Crystals Without Dislocations. H. K. Hardy. *Research,* v. 8, Feb. 1955, p. 57-61.

Mechanism of "whisker" formation on metals. Diagrams, table, photographs, micrograph. 8 ref. (M26)

110-M. (English.) **Measurements of Electron Diffraction Intensities by Means of Geiger Counters. Experimental Determination of Relative Values of the Atomic Factor for Gold, Silver, and Aluminium.** Sven Lennander. *Arkiv för Fysik,* v. 8, no. 6, 1954, p. 551-613.

Includes tables, diagrams, photographs, circuit diagrams, graphs. 54 ref. (M22, M25, Au, Ag, Al)

111-M. (English.) **On the Carbides in Manganese Steels.** Hiroshi Yoshisaki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 5, Oct. 1954, p. 469-476.

Studies to determine whether these carbides are solid solutions or definite chemical compounds. Graphs, diagrams, table. (M26, AY)

112-M. (Dutch.) **The Electron Micrographic Investigation of Steel Structures.** F. van Wijk and J. A. B. Dijck. *Metalen,* v. 9, no. 24, Dec. 31, 1954, p. 389-394.

Techniques for revealing structures of heat treated and cold deformed steels. Micrographs, diagram. 4 ref. (M21, ST)

113-M. (French.) **Grain Size in Cast Iron.** Michel Ferry and Jean-Claude Margerie. *Fonderie,* 1955, no. 108, Jan., p. 4299-4319 + 1 plate.

Variations in microstructure with casting and pouring temperature. Micrographs, graphs, tables, diagrams. 8 ref. (M27, E23, CI)

114-M. (German.) **Investigations on Metal Surfaces With Exo and Photoelectrons.** J. Kramer. *Metalloberfläche,* Ausgabe A, v. 9, no. 1, Jan. 1955, p. 1-6; no. 2, Feb. 1955, p. 28-31.

Exo-electron emission from irradiated surfaces as a new method of investigating surface transformations and reactions. Graphs, photograph. 13 ref. (M23, S19, P15)

115-M. (German.) **Topochemical Reactions for Investigating Structures of Electrolytic Coatings.** Artur Kutzelnigg. *Metalloberfläche,* Ausgabe B, v. 7, no. 2, Feb. 1955, p. 17-20.

Specific etching reagents for determining crystal orientations. Micrographs, diagrams, graphs. 10 ref. (M21, L17, Ni, Cr, Ag)

116-M. (German.) **Structure and Properties of the Silicides.** H. Nowotny and E. Parthé. *Planseeberichte für Pulvermetallurgie,* v. 2, no. 2, Nov. 1954, p. 34-56.

Chemical and crystal structures and properties of mono and polysilicides. Tables, diagrams, graph. 63 ref. (M26, Si)

117-M. (German.) **Spiral Growth on Crystal Planes.** H. Müller. *Umschau in Wissenschaft und Technik,* v. 55, no. 3, Feb. 1, 1955, p. 84-85.

Measurement of pitch, mechanism and cause of growth. Micrographs, diagrams. 2 ref. (M26)

118-M. (German.) **Correlation of the Outer Electron Positions in CuAu($L1_0$), PdCu($L2_0$), and Cu_3Au($L1_2$) Type Structures.** Konrad Schubert. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 43-51.

Lattice-constant values for a large number of alloys. Graphs, tables, diagrams. 32 ref. (M26, EG-a)

119-M. (German.) **Silver-Palladium-Copper Alloys.** Ernst Raub and Georg Worwag. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 52-57.

X-ray studies, thermal analyses and microscopic studies; ternary constitution diagram; susceptibility to age hardening. Tables, graphs, micrographs. 6 ref. (M24, N7, Ag, Pd, Cu)

120-M. (Russian.) **Influence of Aluminum on the Structure and Size of Austenitic Grain, and Impact Strength of Medium-Carbon Steel.** I. S. Gaev and V. V. Polovnikov. *Liteinoe Proizvodstvo,* 1955, no. 1, Jan. p. 18-21.

Experimental data for 0.37% carbon steel with various heat treatments. Micrographs, diagram, graphs, table. 7 ref. (M27, Q6, CN)

121-M. (Russian.) **Distribution of Secondary Electrons of Magnesium and Beryllium Alloys According to Energy.** V. N. Lepeshinskaia and V. M. Tumorin. *Zhurnal Tekhnicheskoi Fiziki,* v. 24, no. 11, Nov. 1954, p. 1933-1941.

Data concerning the mechanism of secondary emission of activated alloys. Graphs. 6 ref. (M25, P17, Mg, Be, Cu, Ag, Al)

122-M. Alloys of Indium: The System Indium-Lead-Tin. A. N. Campbell, R. M. Screaton, T. P. Schaefer, and C. M. Hovey. *Canadian Journal of Chemistry,* v. 33, Mar. 1955, p. 511-526.

Structures were determined by the X-ray and microscopic techniques. Graphs, tables, micrographs. 13 ref. (M24, In, Pb, Sn)

123-M. Theory of Hyperfine Structure. Charles Schwartz. *Physical Review,* v. 97, ser. 2, Jan. 15, 1955, p. 380-395.

Representation of hyperfine reactions in terms of a multipole expansion of field potentials. Graphs, table. 23 ref. (M25)

124-M. (English.) **X-Ray Measurements on Silver Filings.** F. R. L. Schoening and J. N. Van Niekerk. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 10-13.

Measurements on 99.999 and 99.6% pure silver filings at −30° C. No evidence of stacking faults observed. Table, graphs. 11 ref. (M26, Ag)

125-M. (English.) **Metallic Ternary Phases in the Mn-Ta-O System.** Nils Schönberg. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 14-16.

One metallic phase (Mn_3Ta_2O) and one of mixed metallic and non-metallic properties, were found by X-ray analysis. Tables. 1 ref. (M24, Mn, Ta)

126-M. (English.) **Some Applications of Isoactivity Lines.** Mats Hillert. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 34-36.

Connection between slope of tie-lines and change in activity along a phase boundary in ternary alloys. Diagrams. 6 ref. (M24)

127-M. (English.) **Dislocations in Polygonized Germanium.** F. L. Vogel, Jr. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 95-96.

Observations on bent and polyganized germanium single crystals. Micrographs. 6 ref. (M26, Ge)

128-M. (Book.) **Constitution of Titanium Alloy Systems.** Battelle Memorial Institute. PB 111508, 1953, 261 p. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $8.00.

Phase diagrams, and discussions of 48 binary and 22 ternary titanium alloy systems. (M24, Ti)

129-M. (Book—German.) **Introduction to the Investigation of Crystal Lattice by Means of X-Rays.** F. Trey and W. Legat. 112 p. 1954. Springer-Verlag, Wien I, Mölkerbastei 5, Austria.

A handbook for technicians, as a preparation for scientific monographs. Discusses one, two, and three-dimensional lattices. Observation of similarities and as variations of the lattice structures. (M26)

N

Transformations and Resulting Structures

116-N. Surface Nucleation in the Recrystallization of Aluminium Single Crystals. C. D. Graham and R. Maddin. *Insttiute of Metals, Journal,* v. 83, Jan. 1955, p. 169-172 + 1 plate.

Explanation of surface nucleation effect in terms of piled-up dislocations. Diagram, photographs. 10 ref. (N5, N2, Al)

117-N. The Solubility of Vanadium in Gold. D. Summers-Smith. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 189-190.

X-ray studies show maximum solubility is 17.5 at. % at 970° C. and 13 at. % at room temperature. Graphs. 4 ref. (N12, V, Au)

118-N. Thermodynamics of Carbon Dissolved in Iron Alloys. I. Solubility of Carbon in Iron-Phosphorus, Iron-Silicon, and Iron-Manganese Melts. E. T. Turkdogan and L. E. Leake. **II. Influence of Silicon on the Activity Coefficient of Carbon Dissolved in Molten Iron.** E. T. Turkdogan. *Iron and Steel Institute, Journal,* v. 179, Jan. 1955, p. 39-45.

Generalization of effects of alloying elements on carbon solubility; factors responsible for these effects. Diagram, graphs, table. 24 ref. (N12, P12, Fe)

119-N. Nucleation in Transformations in the Irreversible Iron-Nickel Alloys. G. Masing and O. Nickel. *Henry Brutcher Translation no.* 3348, 21 p. (Slightly condensed from *Archiv für das Eisenhüttenwesen,* v. 24, nos. 3-4, 1953, p. 143-151.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 197-N, 1953. (N2, P12, M24, Fe, Ni)

120-N. On the Solubility of Iron in Liquid Slags. P. M. Shurygin and O. A. Esin. *Henry Brutcher Translation no.* 3415, 6 p. (From *Doklady Akademii Nauk SSSR,* v. 95, no. 5, 1954, p. 1043-1045.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 223-N, 1954. (N14, Fe)

121-N. Solubility of Oxygen in Nickel-Chromium and Iron-Nickel-Chromium Melts. S. V. Bezobrazov and A. M. Samarin. *Henry Brutcher Translation no.* 3417, 6 p. (Abridged from *Izvestiya Akademii Nauk SSSR, OTN,* 1953, no. 12, Dec., p. 1790-1796.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 306-N, 1954. (N12, Fe, Ni, Cr)

122-N. (English.) **Dependence of the Intermetallic Diffusion Coefficient Upon Concentration.** Joji Mizuno, Shiro Ogawa and Tokutaro Hirone. *Physical Society of Japan, Journal,* v. 9, no. 6, Nov.-Dec. 1954, p. 961-966.

Diffusion coefficients were obtained by X-ray examination of electrodeposited coatings. Graphs, tables. 9 ref. (N1, L17, Cu, Ni)

123-N. (French.) **Incubation Period of the Martensitic Transformation.** Jean Philibert. *Comptes rendus,* v. 239, no. 23, Dec. 8, 1954, p. 1634-1636.

Study by isothermal dilatometry of transformation at low temperature on a hypereutectoid steel. Graphs. (N8, AY)

124-N. (French.) **General Characteristics of the Alpha⇌Sigma Transformation of Iron-Chromium Alloys.** Paul Bastien and Gilles Pomey. *Comptes rendus,* v. 239, no. 25, Dec. 20, 1954, p. 1797-1799.

High-purity alloys of equal composition which transform completely into the sigma-phase. Micrographs. (N8, Fe, Cr)

125-N. (French.) **Existence of an Order-Disorder Transformation in Ferrochromium Alloys Approaching Equi-Atomic Composition.** Paul Bastien and Gilles Pomey. *Comptes rendus,* v. 239, no. 23, Dec. 8, 1954, p. 1636-1638.

Thermal analysis by magnetometry and dilatometry. Graphs. 1 ref. (N10, Fe, Cr)

126-N. (German.) **Acceleration of the Austenite-Pearlite Transformation of a Case Hardening Steel With 2% Chromium and 2% Nickel by an Addition of Vanadium.** Sepp Ammareller and Paul Opel. *Stahl und Eisen,* v. 75, no. 2, Jan. 27, 1955, p. 65-69.

Time-temperature-transformation curves and case hardening tests show vanadium reduces tendency toward cracking. Graphs, micrographs. (N8, AY)

127-N. (German.) **Age Hardening of Alloys.** H. Knapp. *Umschau in Wissenschaft und Technik,* v. 55, no. 2, Jan. 15, 1955, p. 38-40.

Atomic explanation of hardening principle and its part in distinguishing between age and quench hardening. Graphs, X-ray photographs. (N7, Cu, Al, Mg, Ag)

128-N. (Russian.) **Influence of Oxidation of Cast Iron on the Modification Effect.** B. V. Stark and N. K. Nekrasov. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 18-20.

Relation of microstructure of modified and unmodified cast iron to preliminary oxidation and deoxidation. Effect of amount of silicon under varying conditions. Table, graph, micrograph. 7 ref. (N8, M27, R2, CI)

129-N. Oxygen Solubility and Oxide Phases in the Fe-Cr-O System. D. C. Hilty, W. D. Forgeng and R. L. Folkman. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 253-268.

Phase relations at steelmaking temperatures; two new oxides were identified. Graphs, tables, micrographs. 13 ref. (N12, Fe, Cr)

130-N. Solid Solubility of Calcium in Magnesium. Edmund C. Burke. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 285-286.

Quantitative metallographic results agree with Vosskühler's data and suggest that Haughton's values are too high. Micrograph, graphs. 5 ref. (N12, Ca, Mg)

131-N. Recrystallization Characteristics of Superpurity Base Al-Mg Alloys Containing 0 to 5 Pct Mg. E. C. W. Perryman. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 369-378.

Isothermal softening and micrographic examination show effects of magnesium on rate of nucleation and growth. Tables, micrographs, graphs. 26 ref. (N2, N5, Al, Mg)

132-N. On the Relationship of Texture Changes of Cold-Rolled Face-Centered-Cubic Metals During Recrystallization. Y. C. Liu and W. R. Hibbard, Jr. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 381-384.

Effects of alloying elements on recrystallization texture of copper alloys. Pole figures. 22 ref. (N5, Cu)

133-N. Preferred Orientations in Beta-Annealed Zirconium. J. H. Keeler and A. H. Geisler. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 395-400.

Transformation textures are strongly dependent on the beta-annealing temperature. Tables, pole figures. 15 ref. (N5, Zr)

134-N. Decomposition of Beta Titanium. Franz R. Brotzen, Edward L. Harman, Jr., and Alexander R. Troiano. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 413-419.

Kinetics and nature of precipitation processes in titanium-vanadium alloys. Graphs, tables. 11 ref. (N7, Ti, V)

135-N. Abnormal Grain Growth in Some Aluminum Alloys. T. L. Fritzlen. *Light Metal Age,* v. 12, Feb. 1955, p. 17-19, 41.

Conditions leading to extremely large grains in isolated lots of commercial alloys. Photographs. (N3, Al)

136-N. Effect of Initial Heat-Treatment on the Response of a Steel to Induction Hardening. H. Allsop. *Metal Treatment and Drop Forging,* v. 22, Feb. 1955, p. 47-50, 53.

Effect of initial particle size on rate of re-solution of carbides in medium-carbon steels. Graph, table, micrographs, photographs. (N8, J2, CN)

137-N. (English.) **The Solubility of Nitrogen in α-Iron.** H. U. Aström. *Arkiv för Fysik,* v. 8, no. 6, 1954, p. 495-503.

Relaxation and calorimetric measurements, dependence of relaxation on concentration. Graphs, tables. 9 ref. (N12, Fe)

138-N. (English.) **Investigation of the Critical Shear Stress for Single Crystals of Metallic Solid Solutions. II.** J. O. Linde and Sture Edwardson. *Arkiv för Fysik,* v. 8, no. 6, 1954, p. 511-519.

Critical shear stress increases linearly with solute concentration for dilute solid solutions of copper-base alloys, and the increase, per at. % of solute, varies as the square of corresponding change in lattice parameter. Graphs, tables. 4 ref. (N12, Q2, Cu, Si, Mn, Ni, Ge, In, Sn, Sb, Au)

139-N. (English.) **Formation Energy of Superlattice in Ni_3Fe. III. Kinetics of the Superlattice at the Formation Stage With Long Range Order.** Shuichi Iida. *Physical Society of Japan, Journal,* v. 10, no. 1, Jan. 1955, p. 9-22.

Studies in steady temperature annealing by direct observation of the heat of evolution and by measurement of specific heat. Graphs, tables. 29 ref. (N10, Ni, Fe)

140-N. (English.) **On the Mechanism of Aging in Aluminium-Silver Alloys. II. Nature of the Guinier-Preston Zone.** Ken-ichi Hirano and Hiroto Sakai. *Physical Society of Japan, Journal,* v. 10, no. 1, Jan. 1955, p. 23-30.

Precipitation from supersaturated solid solution of aluminum containing from 5 to 53 wt. % of silver studied by electrical resistance measurements. Graphs. 15 ref. (N7, Al, Ag)

141-N. (French.) **Cause for the Stabilization of Austenite in the Martensitic Transformation.** Jean Philibert. *Comptes rendus,* v. 240, no. 2, Jan. 10, 1955, p. 190-192.

Investigation of ferro-nickel containing traces of carbon and nitrogen; interpretation of phenomenon. Graphs. 2 ref. (N8, Ni)

142-N. (German.) **The Eutectic Structure of Strongly Supercooled Aluminum-Copper and Aluminum-Iron Alloys.** E. Scheil and Y. Masuda. *Aluminium,* v. 31, no. 2, Feb. 1955, p. 51-55.

Special apparatus for severe supercooling. Eutectic composition ranges widen with degree of supercooling. Diagram, graphs, micrographs. 8 ref. (N12, Al, Cu, Fe)

143-N. (German.) **Laws of Growth of Coupled Precipitates.** Otto Krisement. *Archiv für das Eisenhüttenwesen,* v. 26, no. 1, Jan. 1955, p. 55-57.

Growth of particles during precipitation of a new phase from a supersaturated solid solution. Zener's growth law. Double reactions; growth process of coupled precipitates. Graphs. 9 ref. (N7)

144-N. (German.) **The Time Law of the Precipitation of New Phases in Solid Solutions.** Bernhard Ilschner. *Archiv für das Eisenhüttenwesen,* v. 26, no. 1, Jan. 1955, p. 59-62.

Nucleus growth as a problem of diffusion. Diffusion fronts of individual precipitates, exponential growth law. Diagrams, graph. 10 ref. (N7)

145-N. (German.) **Columnar Grain Formation After Deformation and Recrystallization.** Friedrich Erdmann-Jesnitzer and Hilde Ahr. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 26-32.

Explanation of large grains with preferred orientation in parts made by cold working from sheets of pure aluminum, aluminum-magnesium alloy and pure zinc. Micrographs, photographs, diagram. 19 ref. (N5, Q24, Al, Mg, Zn)

146-N. (Russian.) **Nature of the Process Limiting the Graphitization Rate of Cast Iron.** M. A. Krishtal. *Doklady Akademii Nauk SSSR,* v. 99, no. 6, Dec. 21, 1954, p. 983-986.

Isotherms for cast irons alloyed with cobalt, silicon and cobalt, and tungsten and silicon. Graphs. 12 ref. (N8, CI, Co, Si, W)

147-N. (Russian.) **Influence of Chromium on the Self-Diffusion of Iron.** P. L. Gruzin. *Doklady Akademii Nauk SSSR,* v. 100, no. 1, Jan. 1, 1955, p. 65-67.

Relation of temperature to coefficients of diffusion for different chromium-iron ratios. Graphs, tables. 4 ref. (N1, Fe, Cr)

148-N. (Russian.) **Isothermal Transformation of Ferrite in High-Alloy Austenitic-Ferritic Alloys.** E. M. Pivnik. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 1, Jan. 1955, p. 135-143.

Quenching and aging effects; formation of sigma phase. Tables, diagrams, micrographs. 7 ref. (N8, N7, SS)

149-N. (Russian.) **Method of Determining the Coefficient of Self-Diffusion of Iron in Alloyed Austenite.** M. A. Krishtal. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 1, Jan. 1955, p. 144-148.

Based on decarbonization rate of graphitized cast iron; relation of temperature and silicon content to self-diffusion of iron. Tables. 13 ref. (N1, CI)

150-N. (English.) **The Segregation of Impurities to Grain Boundaries.** W. R. Thomas and B. Chalmers. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 17-21.

Effects of grain orientations and annealing temperature on polonium segregation in lead-bismuth alloys. Micrograph, graphs, table. 16 ref. (N1, Pb, Bi, Po)

151-N. (English.) **Solubility of Cementite in Liquid Iron.** Mats Hillert. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 37-38.

Solubility curves for graphite and cementite in liquid iron intersect at 10° C. below the eutectic temperature. Explanation of solidification characteristics of cast iron. Graphs. 8 ref. (N12, CI)

152-N. (English.) **Lattice and Grain Boundary Self-Diffusion in Cadmium.** E. S. Wajda, G. A. Shirn and H. B. Huntington. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 39-42.

Effect of temperature on diffusion in 99.5% pure crystals. Graphs, tables. 5 ref. (N1, Cd)

153-N. (English.) **Kinetics of Precipitation of Tin From Lead-Tin Solid Solutions.** D. Turnbull and H. N. Treaftis. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 43-54.

Nucleation and growth of cells; construction of cells; effects of cold work on precipitation rate. Diagram, tables, graphs, micrographs. 15 ref. (N7, Sn, Pb)

154-N. (English.) **Theory of Cellular Precipitation.** David Turnbull. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 55-63.

Mechanisms of tin precipitation from lead-tin alloys. Graphs. 17 ref. (N7, Pb, Sn)

155-N. (English.) **The Influence of Grain Boundaries on the Nucleation of Secondary Phases.** P. J. Clemm and J. C. Fisher. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 70-73.

Calculation of critical energy for nucleation of ferrite from austenite at 2, 3 and 4-grain junctions. Diagrams, graph. 3 ref. (N2, ST)

156-N. (English.) **Transition Structure in Lead-Silver Alloys and a Dislocation Mechanism.** R. D. Heidenreich. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 79-86.

Electron metallographic study of alloys with 0.009 to 0.23% silver; dislocation model explains precipitation hardening and the hexagonal transition structure. Graphs, tables, micrographs, diagrams. 9 ref. (N7, M26, Pb, Ag)

157-N. (English.) **Self-Diffusion in Thallium.** G. A. Shirn. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 87-88.

Studies with Tl^{204} as a tracer at 150 to 275° C.; possible diffusion mechanisms. Graphs, tables. 2 ref. (N1, Tl)

158-N. (English.) **The Diffusion of Hydrogen in Iron and Ferritic Steels.** E. W. Johnson and M. L. Hill. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 99-101.

Tests on 99.9% iron show that slowly diffusing hydrogen is a real component of the system and its amount depends on temperature and prior thermal history of the iron. Table. 11 ref. (N1, Fe)

159-N. (English.) **A Possible Explanation of the Stability of Guinier-Preston Zones.** J. Nyström. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 103.

Nucleation and growth of a new phase due to diffusion of a solute. (N2, N1)

160-N. (German.) **On the Hardening of Aluminum-Silver Alloys in Thin Films.** Albert Winkelmann. *Zeitschrift für angewandte Physik,* v. 7, no. 1, Jan. 1955, p. 7-12.

Structural change during precipitation hardening of vapor-deposited aluminum-silver alloys explains segregation of hexagonal gamma phase Ag_2Al. Graphs, diagrams. 10 ref. (N7, Ag, Al)

161-N. (Russian.) **The Shape of Pores Appearing During Mutual Diffusion of Metals.** Ia. E. Geguzin. *Doklady Akademii Nauk SSSR,* v. 100, no. 2, Jan. 11, 1955, p. 255-257 + 1 plate.

Action in alpha-brass, copper-nickel and copper-alpha-brass when heating in a vacuum at 950° C. Micrographs, photograph. 5 ref. (N1, Cu, Ni, Zn)

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Physical Properties and Test Methods

90-P. Determination of the Thermal Conductivity of Molten Lithium. Henry A. Webber, David Goldstein and Robert C. Fellinger. *ASME, Transactions*, v. 77, Feb. 1955, p. 97-101; disc., p. 101-102.

Measurements for range of 420 to 1002° F. Diagrams, tables, graph. 7 ref. (P11, Li)

91-P. Nitrides of Chromium and Chromium-Titanium Alloys. New Film-Type Resistance Elements. E. R. Olson, E. H. Layer and A. E. Middleton. *Electrochemical Society, Journal*, v. 102, Feb. 1955, p. 73-76.

Electrical properties of nitrided chromium and chromium-titanium films. Diagram, graphs. 6 ref. (P15, Cr, Ti)

92-P. Hydrogen Overvoltage and Electrode Material. A Theoretical Analysis. Paul Rüetschi and Paul Delahay. *Journal of Chemical Physics*, v. 23, Jan. 1955, p. 195-199.

Shows on theoretical basis that overvoltage for hydrogen evolution on various metals and for otherwise identical conditions of electrolysis is essentially a linear function of heat of adsorption of atomic hydrogen on the electrode. Graphs, tables. 40 ref. (P15, L17)

93-P. Determining Amount of Nitrogen and Nitrides in Fe-C Alloys. (Digest of "Thermodynamics of Metal Nitrides and of Nitrogen in Iron and Steel", by J. Pearson and U. J. C. Ende, *Iron and Steel Institute, Journal*, v. 175, Sept. 1953, p. 52-58.) *Metal Progress*, v. 67, Feb. 1955, p. 172, 176, 178, 180.

Effects of steelmaking practices and melt composition on solubility of nitrogen in steel. (P12, D general, ST)

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Greatest effect on magnetic properties is by rate of cold rolling. Tables, micrographs, graphs. 2 ref. (P16, Fe)

95-P. (English.) Magneto-Thermoelectric Powers of Nickel Single Crystals. Nahonori Miyata and Zenya Funatogawa. *Physical Society of Japan, Journal*, v. 9, no. 6, Nov.-Dec. 1954, p. 967-973.

Experimental determinations at various temperatures. Graphs, tales. 3 ref. (P15, P16, Ni)

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Investigation of intrinsic magnetic properties of compound; relationship between magnetic field and temperature. Graphs. 4 ref. (P16, Mn, Au)

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Properties and structures of alloys in systems which may be identified by their metallic behavior or by their semiconducting properties; physical parameters determine nature of electronic condition. Graphs, phase diagram. 34 ref. (P15, Zn, Sb, In, Bi, Au, S)

98-P. (German.) Investigations of Irreversible Magnetization and Hysteresis. Jakob Kranz. *Zeitschrift für Physik*, v. 139, no. 5, 1954, p. 619-637.

Apparatus for measuring Barkhausen effect which occurs in magnetic reversal of a ferromagnetic specimen. Diagrams, graphs, tables. 17 ref. (P16, Ni, Cu, CN, Fe)

99-P. Thermodynamics of Carbon Dissolved in Iron Alloys. III. Solubility of Carbon in Iron-Sulphur Melts. E. T. Turkdogan and R. A. Hancock. *Iron and Steel Institute, Journal*, v. 179, Feb. 1955, p. 155-159 + 1 plate.

Determination at 1200, 1350 and 1500° C. shows that sulfur decreases solubility of carbon more than silicon and phosphorus. Tables, photographs, graphs. 9 ref. (P12, ST)

100-P. Some Physical Properties of Plutonium Metal. Eric R. Jette. *Journal of Chemical Physics*, v. 23, Feb. 1955, p. 365-368.

Melting points, densities, expansion coefficients, electrical resistance and magnetic susceptibility of metal of various degrees of purity. Graphs, tables. (P general, Pu)

101-P. Effect of Boron on the Relative Interfacial Tension of Gamma Iron. A. M. Adair, J. W. Spretnak and Rudolph Speiser. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Feb. 1955, p. 353-354.

Angles of grooves developed at grain-boundaries during heat etching in vacuum indicate that boron reduced the interfacial energy but not enough to explain its hardenability effects. Tables. (P10, AY)

102-P. Structure and Magnetic Properties of Some Transition Metal Nitrides. George W. Wiener and J. Alfred Berger. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Feb. 1955, p. 360-368.

Nitrogen appears to react with the *d*-shell so as to reduce magnetic moments. Tables, diagrams, micrographs, refractogram, graphs. 16 ref. (P16, Mn, Fe, Co, Ni)

103-P. A Calorimetric Investigation of the Energy Relations in Alloys of Composition Cu_3Au. L. R. Rubin, J. S. L. Leach and M. B. Bever. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Feb. 1955, p. 421-423.

Energies of formation in ordered and disordered solid solutions. Graph. 15 ref. (P12, N10, Cu, Au)

104-P. Enthalpy and Specific Heat of Four Corrosion-Resistant Alloys at High Temperatures. Thomas B. Douglas and James L. Dever. *Journal of Research, National Bureau of Standards*, v. 54, Jan. 1955, p. 15-19.

Experimental data for 80 nickel, 20 chromium, Type 347 stainless, Type 446 stainless from 0 to 900° C.; and for Monel from 0 to 300° C. Tables, graphs. 12 ref. (P12, Ni, Cr, Cb, Cu, SS)

105-P. Melting Points of Metals and Their Oxides. *Materials & Methods*, v. 41, Feb. 1955, p. 127, 129.

Data sheet. (P12)

106-P. Zeeman Effect of Gold. J. B. Green and H. N. Maxwell. *Optical Society of America, Journal*, v. 45, Feb. 1955, p. 98-102.

Experimental data for gold I and gold II. Tables. 10 ref. (P17, Au)

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Calculations based on intensity of magnetization and field strength, using the Néel model of domain structure. Graphs, table. 9 ref. (P16, Si, Fe)

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Magnetic scattering and magnetic moments for ordered and disordered alloys in the iron-chromium, nickel-iron, cobalt-chromium and nickel-manganese systems. Graphs, tables. 5 ref. (P16, Fe, Cr, Ni, Co, Mn)

109-P. Trapping of Minority Carriers in Silicon. I. *P*-Type Silicon. J. A. Hornbeck and J. R. Haynes. *Physical Review*, v. 97, ser. 2, Jan. 15, 1955, p. 311-321.

Properties of two types of electron traps; deep-trap concentration is proportional to conductivity. Graphs, diagrams, photographs, table. 12 ref. (P15, Si)

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Mathematical development; limitations of the model. Table, graphs. 18 ref. (P17, P12, Na)

111-P. Irradiation Effects in Cu, Ag, and Au Near 10° K. H. G. Cooper, J. S. Koehler and J. W. Marx. *Physical Review*, v. 97, ser. 2, Feb. 1, 1955, p. 599-607.

Electrical resistivity increases produced by 12 m.e.v. deuteron irradiation measured as a function of integrated deuteron flux. Diagrams, tables, graphs. 16 ref. (P15, Cu, Ag, Au)

112-P. Measurements of Electrical Conductivity and Magnetoresistance of Gray Tin Filaments. A. W. Ewald and E. E. Kohnke. *Physical Review*, v. 97, ser. 2, Feb. 1, 1955, p. 607-613.

Preparation of gray tin filaments suitable for electrical measurements. Temperature dependence of electrical conductivity and magneto-resistance in pure gray tin and alloys containing various amounts of antimony, arsenic, indium, aluminum and zinc. Tables, graphs. (P15, P16, Sn)

113-P. Band Model for Hall Effect, Magnetization, and Resistivity of Magnetic Metals. Emerson M. Pugh. *Physical Review*, v. 97, ser. 2, Feb. 1, 1955, p. 647-654.

Hall data, saturation magnetization and resistivity data for copper, nickel and cobalt, and their binary alloys can be made understandable by employing a four-band model, consisting of two 4*s* bands and two bands from the 3*d* shell. Graphs, diagrams. 21 ref. (P15, P16, Cu, Co, Ni)

114-P. Resistance and Thermoelectric Measurements of Cold-Worked Copper and the Resistance Minimum at Low Temperatures. W. B. Pearson. *Physical Review*, v. 97, ser. 2, Feb. 1, 1955, p. 666-669.

Measurements of change of residual resistance ratio of copper as function of the percentage reduction in cross-sectional area by cold working in liquid helium, liquid nitrogen or at room temperature, and subsequent ageing treatments. Graphs. 19 ref. (P15, Cu)

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con by External Electric Fields. G. G. E. Low. *Physical Society, Proceedings*, v. 68, no. 421B, Jan. 1955, p. 10-16.

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Studies above Curie temperatures suggest phase diagram changes. Tables, graphs, phase diagrams. 14 ref. (P16, M24, Fe, Co)

117-P. (English.) **On a New Anomaly in the Alloys of Nickel and Cobalt. I. The Effect of Heat Treatment in Magnetic Field on Their Magnetic Properties.** Hakaru Masumoto, Saburo Inoue and Itsujiro Ukaji. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 6, no. 4, Aug. 1954, p. 375-383.

Permeability of a 60% cobalt alloy changed from 1050 to 16,600 after cooling. Tables, graphs. 6 ref. (P16, Co, Ni)

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Results of dynamic measurements of Young's modulus and its change with magnetization. Ballistic measurements of ferromagnetic characteristics. Tables, graphs. 26 ref. (P16, Q21, Cu, Ni)

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Variation in magnetic annealing effects in samples of different shapes. Graphs. 4 ref. (P16, Ni, Co)

120-P. (German.) **A Relationship Between Hysteresis Coefficient and Permeability. II. Additional Results of Measurements.** M. Kornetzki. *Zeitschrift für angewandte Physik*, v. 6, no. 12, Dec. 1955, p. 547-550.

Measurements on steels, aluminum and nickel alloys and ferrites. Table, graphs. 11 ref. (P16, SG-n)

121-P. (German.) **The Specific Heat of Nickel Between 180 and 1160° C.** Friedrich Krauss and Heinz Warncke. *Zeitschrift für Metallkunde*, v. 46, no. 1, Jan. 1955, p. 61-69.

Two methods of determining temperature dependence. Diagrams, graphs, tables. 25 ref. (P12, Ni)

122-P. (German.) **Self-Absorption of Beta-Activated Thallium in the Superconducting State.** Oswald Riedel and Fritz Schmeissner. *Zeitschrift für Physik*, v. 140, no. 1, 1955, p. 92-96.

It is experimentally shown that beta radiation of a sheet of thallium which contains the active Tl^{204} isotope does not change when the metal becomes superconducting. Diagram. 9 ref. (P15, Th)

123-P. (Russian.) **Electrical Properties of Bismuth Alloys. I. Solubility of Impurities and Nature of Their Effect on Electric Properties of Bismuth. II. Relation of Electrical Properties of Bismuth Alloys to the Impurity Concentrations.** G. A. Ivanov and A. R. Regel'. *Zhurnal Tekhnicheskoi Fiziki*, v. 25, no. 1, Jan. 1955, p. 39-65.

Experimental data on numerous binary and ternary alloys. Tables, graphs. 47 ref. (P15, Bi)

124-P. (Russian.) **Relation of Coercive Force to Thickness of Sheets of Iron-Silicon Alloys.** Iu. P. Burdakova and V. V. Druzhinin. *Zhurnal Tekhnicheskoi Fiziki*, v. 25, no. 1, Jan. 1955, p. 108-111.

Effects of etching and rolling on magnetic properties. Graphs, table. 3 ref. (P16, ST)

125-P. (Russian.) **Polarographic Characteristics and the Normal Potential of a Metal. I-II.** Ia. I. Tur'ian and E. I. Grinberg. *Zhurnal Fizicheskoi Khimii*, v. 28, no. 12, Dec. 1954, p. 2152-2155.

Experimental determination in ethyl alcohol solutions. Tables. 11 ref. (P15, Zn, Pb, Tl, Cd)

126-P. A New High-Temperature Reaction Calorimeter. The Heats of Mixing of Liquid Lead-Tin Alloys. O. J. Kleppa. *Journal of Physical Chemistry*, v. 59, Feb. 1955, p. 175-181.

Description and operation of calorimeter. Diagram, tables, graph. 18 ref. (P12, Pb, Sn)

127-P. The Structure and Properties of Some Ternary Alloys of Manganese, Zinc and Carbon. R. G. Butters and H. P. Myers. *Philosophical Magazine*, v. 46, 7th ser., no. 373, Feb. 1955, p. 132-143.

Effects of structure on magnetic properties. Tables, diagrams, graphs. 6 ref. (P16, M general, Mn, Zn)

128-P. (English.) **Nuclear Electric Quadrupole Interactions in Aluminum.** T. J. Rowland. *Acta Metallurgica*, v. 3, no. 1, Jan. 1955, p. 74-78.

Magnitude of electric gradients at aluminum lattice sites by solute atoms of magnesium or zinc; effects of precipitation and annealing. Graphs. 19 ref. (P15, N7, J23, Al, Mg, Zn)

129-P. (English.) **Resistivity Changes in Silicon Single Crystals Induced by Heat Treatment.** C. S. Fuller, J. A. Ditzenberger, N. B. Hannay and E. Buehler. *Acta Metallurgica*, v. 3, no. 1, Jan. 1955, p. 97-99.

Change in carrier concentration at various temperatures appear to be associated with the crystal-growing process. Graphs, photograph. 4 ref. (P15, N3, Si)

130-P. (German.) **A New Rhodium Isotope (106) With a Decay Period of 117 Minutes.** G. B. Baro. W. Seelmann Eggebert and I. E. Zabala. *Zeitschrift für Naturforschung*, v. 10a, no. 1, Jan. 1955, p. 80.

Extraction of the isotope and its radioactive properties. 1 ref. (P13, Rh)

131-P. (Russian.) **Temperature Dependence of Cobalt Magnetization in Weak Magnetic Fields.** T. A. Elkina. *Moskovskogo, Universiteta, Vestnik, Seriia Fiziko-Matematicheskikh i Estestvennykh Nauk*, 1954, no. 12, Dec., p. 49-52.

Investigation in the temperature range 20 to 800° C. Graphs. 6 ref. (P16, Co)

132-P. (Russian.) **Semiconducting Properties of Certain High-Resistance Metallic Alloys.** A. I. Drabkin. *Zhurnal Tekhnicheskoi Fiziki*, v. 25, no. 1, Jan. 1955, p. 81-84.

Properties of Constantan and Manganin before and after heat treatment. Tables. (P11, Cu, Ni, Mn)

133-P. (Book.) **The Theory of Cohesion.** M. A. Jaswon. Pergamon Science Series. Metal Physics and Physical Metallurgy. v. 11. 245 p. 1954. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. $5.75.

Mathematical and physical arguments involved in the theory of cohesion in aggregates, particularly in metals, which help bridge the gap between elementary and advanced treatments. (P10)

Q Mechanical Properties and Test Methods; Deformation

288-Q. Elastic Constants and Coefficients of Thermal Expansion of Piping Materials Proposed for 1954 Code for Pressure Piping. Rudolph Michel. *ASME, Transactions*, v. 77, Feb. 1955, p. 151-157; disc., p. 157-159.

Data for ferrous and nonferrous materials recommended for pressure piping. Tables, graphs. 55 ref. (Q21, P11)

289-Q. In-Plane Bending Properties of Welding Elbows. P. L. Vissat and A. J. Del Buono. *ASME, Transactions*, v. 77, Feb. 1955, p. 161-171; disc., p. 171-175.

Strain-gage investigation on heavy-wall "Weld-Ells"; results compared with theoretical calculations. Graphs, photographs, tables, diagrams. 16 ref. (Q25, K general, CN)

290-Q. On the Representation of Rheological Results With Special Reference to Creep and Relaxation. P. Feltham. *British Journal of Applied Physics*, v. 6, Jan. 1955, p. 26-31.

Accounts for characteristic similarities in stress relaxation and creep behavior of materials on basis of generalized statistical model. Graphs. 38 ref. (Q3, Al)

291-Q. Correlations of Rupture Data for Metals at Elevated Temperatures. Raymond L. Orr, Oleg D. Sherby and John E. Dorn. *California, University, Institute of Engineering Research*, Series no. 22, Technical Report no. 27, July 1, 1953, 25 p. + 5 plates. (Available as PB 111348, *U. S. Department of Commerce, Office of Technical Services*, Washington, D. C. $1.00.)

Data for aluminum, beryllium, titanium, nickel, niobium, molybdenum and several alloys. Graphs, table 19 ref. (Q4, Al, Be, Ti, Ni, Nb, Mo)

292-Q. Theory of Plasticity: A Survey of Recent Achievements. I-II. William Prager. *Engineer*, v.199, Jan. 21, 1955, p. 81-83; Jan 28, 1955, p. 116-118.

Stress analysis of structures; plastic considerations. Diagrams, photograph, graphs. (Q23, Q25)

293-Q. The Ultimate Strength of Thick-Walled Cylinders Subjected to Internal Pressure. I. Apparatus for Producing Very High Pressures. II. Test Results and Their Relation to Ultimate-Strength Equations. B. Crossland and J. A. Bones. *Engineering*, v. 179, Jan. 21, 1955, p. 80-83; Jan. 28, 1955, p. 114-117.

Experiments verify Manning's theory for ultimate bursting pressures. Relation of type of fracture to tension and torsion properties. Photographs, diagrams, graphs, tables. 15 ref. (Q23, Q1, Q27, CN)

294-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *Foundry*, v. 83, Feb. 1955, p. 96 + 6 pages.

Load carrying ability from 700 to 1000° F. as influenced by composition and structure. Graphs, tables. 27 ref. (Q23, CI)

295-Q. The Effect of Internal Oxidation on the Fatigue Properties of Copper Alloys. J. W. Martin and G. C. Smith. *Institute of Metals, Journal*, v. 83, Jan. 1955, p. 153-165 + 2 plates.

Internal oxidation reduced fatigue life of polycrystalline copper but increased that of single crystal specimens. Diagram, graphs, micrographs. 13 ref. (Q7, R2, Cu)

296-Q. The Influence of Sub-Structure on the Slip Observed in Pure Aluminium and Some Aluminium Alloys When Subjected to Fatigue Stresses. P. J. E. Forsyth and C. A. Stubbington. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 173-175 + 3 plates.

Tests at room and subzero temperatures show that fatigue stresses promote self-annealing and polygonization. Table, diagrams, micrographs. 4 ref. (Q7, Q25, Al)

297-Q. A Note on the Influence of Grain-Boundary Flow in the Creep of a Lead-0.5% Tin Alloy. P. Brock. *Institute of Metals, Journal,* v. 83, Jan. 1955, p. 191 + 1 plate.

Effects of grain size and stress on creep rate and mechanism. Graph, micrographs. 3 ref. (Q3, Pb)

298-Q. Some Experiments on the Alternating Stress Fatigue of a Mild Steel and an Aluminium Alloy at Elevated Temperatures. P. G. Forrest and H. J. Tapsell. *Institution of Mechanical Engineers, Proceedings,* v. 168, no. 29, 1954, p. 763-772; disc., p. 772-774.

Tests made at several speeds between 10 and 8000 cycles per min. on a normalized 0.17% carbon steel at air temperature of 400, 450 and 500° C. and on an aluminum alloy, in a fully softened condition, at 200° C. Tables, graphs, photographs. 14 ref. (Q7, CN, Al)

299-Q. The Fatigue Strength Under Bending, Torsional and Combined Stresses of Steel Test Pieces With Stress Concentrations. R. C. A. Thurston and J. E. Field. *Institution of Mechanical Engineers, Proceedings,* v. 168, no. 31, 1954, p. 785-792; disc., p. 793-796.

Intrinsic and V-notched fatigue strength under various combinations of bending and torsion. Diagrams, graphs, tables, 10 ref. (Q7, ST)

300-Q. Determination of Residual Stresses in Lightly Rolled Thin Strip. B. B. Hundy. *Iron and Steel Institute, Journal,* v. 179, Jan. 1955, p. 23-29.

Residual stresses increase with amount of reduction. Stress distribution is different for copper and steel. Graphs. 20 ref. (Q25, Cu, CN)

301-Q. Analysis of the Effect of Various Factors on Metal Transfer and Wear Between Specimen Pairs of Same Metal and Same Shape. I. The Basic Scheme of Formulation of Metal Transfer and Wear. II. Effect of the Surrounding Atmosphere. I-Ming Feng. *Journal of Applied Physics,* v. 26, Jan. 1955, p. 24-32.

Theoretical analysis. Graphs. 13 ref. (Q9)

302-Q. Elastic Description of a High-Amplitude Spherical Pulse in Steel. William A. Allen and Werner Goldsmith. *Journal of Applied Physics,* v. 26, Jan. 1955, p. 69-74.

Calculation of effect of cylindrical charge of high explosive detonated in intimate contact with a steel plate. Graphs. 24 ref. (Q21)

303-Q. Some Fundamental Experiments on High Temperature Creep. J. E. Dorn. *Journal of the Mechanics and Physics of Solids,* v. 3, Jan. 1955, p. 85-116 + 4 plates.

Theoretical analysis of published experimental data. Graphs, micrographs, tables, X-ray diffractograms. 57 ref. (Q3)

304-Q. Load-Carrying Capacities for Circular Plates of Perfectly-Plastic Material With Arbitrary Yield Condition. H. G. Hopkins and A. J. Wang. *Journal of the Mechanics and Physics of Solids,* v. 3, Jan. 1955, p. 117-129.

Stress analysis of material that obeys an arbitrary yield condition and associated flow rule. Diagrams, graphs. 9 ref. (Q25)

305-Q. A Theory of the Tensile and Compressive Textures of Face-Centred Cubic Metals. J. F. W. Bishop. *Journal of the Mechanics and Physics of Solids,* v. 3, Jan. 1955, p. 130-142.

Hypothesis to account for different textures observed under similar straining conditions by metals of same lattice type. Diagrams. 30 ref. (Q24)

306-Q. A Theory of the Plastic Yielding Due to Bending of Cantilevers and Beams. II. A. P. Green. *Journal of the Mechanics and Physics of Solids,* v. 3, Jan. 1955, p. 143-155 + 2 plates.

Effect of weak end support under conditions of plane stress. Diagrams, tables, graphs, photographs. 5 ref. (Q5, Q25)

307-Q. The Plastic Bending and Twisting of Square Section Members. M. C. Steele. *Journal of the Mechanics and Physics of Solids,* v. 3, Jan. 1955, p. 156-166.

Stress analysis of long prismatic member acted on by combinations of bending moments and torques of such a magnitude as to render member just fully plastic. Diagrams, graphs, table. 6 ref. (Q5, Q25)

308-Q. Metallic Friction and Lubrication by Laminar Solids. A Review of Current Theories. Ernest Koenigsberg and V. R. Johnson. *Mechanical Engineering,* v. 77, Feb. 1955, p. 141-147.

Analysis of validity of current knowledge and hypotheses. Diagrams, graphs. 48 ref. (Q9)

309-Q. The Effect of Zinc in Aluminium-Silicon-Copper Casting Alloys. F. H. Smith. *Metallurgia,* v. 51, no. 303, Jan. 1955, p. 24-28.

Up to 3% zinc was shown to have no harmful effect on room temperature mechanical properties. Tables, graphs, 9 ref.
(Q general, Al, Si, Cu, Zn)

310-Q. Micro-Indentation Hardness Testing. Variation of Scatter of Results with Load. B. W. Mott and S. D. Ford. *Metal Treatment and Drop Forging,* V. 22, Jan. 1955, p. 9-12.

Survey of range of scatter of hardness values of copper and steel specimens recorded at loads varying from 25 to 2500 g. Tables, graphs. 5 ref. (Q29, ST, Cu)

311-Q. Dislocation Energies and Choice of Slip Plane in Face Centred Cubic Metals. A. J. E. Foreman and W. M. Lomer. *Philosophical Magazine,* v. 46, 7th ser., no. 372, Jan. 1955, p. 73-76.

Analysis of mode of deformation of metal crystal. Graph. 6. ref. (Q24)

312-Q. Point Defects and the Release of Energy from Deformed Nickel. J. F. Nicholas. *Philosophical Magazine,* v. 46, 7th ser., no. 372, Jan. 1955, p. 87-97.

Theoretical and experimental determination of activation energy for migration of defects. Graphs. 10 ref. (Q24, P13, Ni)

313-Q. Apparatus for Studying Friction and Sliding Electrical Contacts. D. G. Flom. *Review of Scientific Instruments,* v.26 Jan. 1955, p. 1-4.

Kinetic friction is recorded by a sensitive strain gage system. Photographs, diagram, graphs. (Q9, Q25)

314-Q. Friction Apparatus for Very Low-Speed Sliding Studies. F. Heymann, E. Rabinowicz and B. G. Rightmire. *Review of Scientific Instruments,* v. 26, Jan. 1955, p. 56-58.

Device eliminates stick-slip vibration. Diagrams, charts. 5 ref. (Q9)

315-Q. Where Heat Is King. I-II. Alan Levy. *Steel,* v. 136, Jan. 31, 1955, p. 86-89; Feb. 7, 1955, p. 146-148, 151-152.

Properties of available high-temperature alloys; applications. Photographs, graph, tables.
(Q general, SG-h)

316-Q. The Correlation of High Temperature Rupture Data For Niobium. Raymond L. Orr and Douglas W. Bainbridge. *U. S. Department of Commerce, Office of Technical Services,* PB 111349, July 1953, 5 p. $1.00.

Data for tests at 1144° K. and stresses from 18,000 to 25,000 psi. correlated with data for 1255° K. Table, graph. 3 ref. (Q4, Cb)

317-Q. Inelastic Behavior of Ductile Members Under Dead Loading. M. E. Clark, H. T. Corten and O. M. Sidebottom. *University of Illinois Bulletin (Engineering Experiment Station Bulletin No. 426,)* v. 52, no. 16, Oct. 1954, 48 p.

Time effects associated with dead-loading of steel and aluminum beams. Graphs, photographs, diagrams, micrograph. 53 ref.
(Q23, CN, Al)

318-Q. Transition Temperature Behavior of Pressure Vessel Steels. L. J. McGeady. *Welding Journal,* v. 34, Jan. 1955, p. 1S-11S.

Notched-bar behavior of low carbon plate steels meeting ASTM specifications. Tables. 55 ref. (Q23, CN)

319-Q. Blistering and Embrittlement of Pressure Vessel Steels by Hydrogen. G. A. Nelson and R. T. Effinger. *Welding Journal,* v. 34, Jan. 1955, p. 12S-21S.

Mechanisms of hydrogen damage; effects of temperature and pressure; prevention of damage to pressure vessels. Graph, table, micrographs, photographs, diagram. 9 ref. (Q23, ST)

320-Q. Studies of the Biaxial Fatigue Properties of Pressure Vessel Steels. C. E. Bowman and T. J. Dolan. *Welding Journal,* v. 34, Jan. 1955, p. 51S-59S.

Effect of welding, notches, attachments and fabrication on plastic bi-axial fatigue properties. Photographs, tables, diagrams, graphs. 7 ref. (Q7, ST)

321-Q. A New Criterion of Brittleness and Plasticity of Metals. G. V. Uzhik. *Henry Brutcher Translation no. 2907,* 4 p. Henry Brutcher, Altadena, Calif. (From *Doklady Akademii Nauk SSSR,* v. 68, no. 6, 1949, p. 1037-1039.)

Previously abstracted from original. See item 62-Q, 1950. (Q23)

322-Q. Cracks in Tube Bends. S. Berg. *Henry Brutcher Translation no.* 3113 8 p. Henry Brutcher, Altadena, Calif. (Condensed from *BWK (Brennstoff-Warme-Kraft),* v. 4, no. 12, 1952, p. 413-415.)

Previously abstracted from original. See item 114-Q, 1953.
(Q5, ST, CI)

323-Q. On the Nature of Weld Hot Cracking. B. I. Medovar. *Henry Brutcher Translation no.* 3400, 29 p. Henry Brutcher, Altadena, Calif. (From *Avtomaticheskaya Svarka,* v. 7, no. 4, 1954, p. 12-28.)

Review of American and Soviet work over past two years; applicability of Bochvar's theory regarding hot shortness of cast metals; mechanisms and factors involved in cracking. Micrographs, diagrams, graph, table, phase diagram. 23 ref. (Q26, K general, SS, AY, Sn)

324-Q. (French.) **Effect of Transformation Conditions on the Mechanical Properties of Steel Plate With Ultimate Strength of 40 to 50 kg. per mm².** Hocquet. *Centre de Documentation Sidérurgique, Circulaire de'Informations Techniques,* v. 11, no. 12, 1954, p. 2323-2342.

Results of investigation of tensile strength, elongation, and elastic limit of killed and rimmed steels. Graphs. (Q23, CN)

325-Q. (French.) **Utilization of Networks for the Experimental Study of Elastic and Plastic Phenomenon.** Pierre Dantu. *Comptes rendus,* v. 239, no. 25, Dec. 20, 1954, p. 1769-1771.

Photoelastic technique for three-dimensional problems. Stress patterns. (Q25)

326-Q. (French.) **Photoelastometric Study of a Tri-Dimensional Notch in Torsion.** J. Aubaud. *Recherche Aéronautique,* 1954, no. 42, Nov.-Dec., p. 13-16.

Solidification of stresses in polyester resin. Photographs, diagrams. 4 ref. (Q25, Q1)

327-Q. (French.) **Creep Test in Controlled Atmosphere.** J. Poulignier and J. Ramain. *Recherche Aéronautique,* 1954, no. 42, Nov.-Dec., p. 45-49.

Recording apparatus and atmosphere generating equipment. Photographs, diagrams. 2 ref. (Q3)

328-Q. (French.) **Brittle Fractures and Strength in the Thickness Direction of Steel.** W. Soete. *Revue de métallurgie,* v. 51, no. 12, Dec. 1954, p. 813-822; disc., p. 823.

Notched-bar tests in which cracks appear parallel to the principal stress show that a triaxial stress state no longer exists. A banded structure with low strength in the thickness direction explains this behavior. Photographs, graphs, table, diagrams. (Q26, Q23, CN)

329-Q. (French.) **Polygonization of High Purity Iron.** J. Talbot, C. de Beaulieu and G. Chaudron. *Revue de métallurgie,* v. 51, no. 12, Dec. 1954, p. 839-844.

Polygonization appears at lower temperatures with higher purity and is a stable state in cold worked iron. Micrographs, photographs. 9 ref. (Q24, Fe)

330-Q. (French.) **Commission for Studying the High Temperature Metals of the IRSID. Properties of 0.6% Cr and 0.6% Mo, 2.25% Cr and 1% Mo, and 22% Cr and 18% Ni Steels.** G. Delbart and A. Constant. *Revue de métallurgie,* v. 51, no. 12, Dec. 1954, p. 845-868.

Rupture and creep data for times up to 20,000 hr. Graphs, micrographs, tables, photographs. (Q3, Q4, AY, SS)

331-Q. (German.) **Theory of Internal Damping of Vibrating Solids.** Kurt Voelz. *Abhandlungen der Braunschweigischen Wissenschaftlichen Gesellschaft,* v. 6, 1954, p. 126-165.

Theories of Maxwell, Kelvin, Prandtl and Eyring; damping independent of frequency; true relaxation phenomena. Graphs, diagrams. 35 ref. (Q8)

332-Q. (German.) **Cast Iron With Nodular Graphite as a Material for Mechanically, Thermally, and Chemically Stressed Castings.** Helmut Timmerbeil. *Giesserei,* v. 42, no. 1, Jan. 6, 1955, p. 7-15.

Damping capacity of the graphite; improvement by thermal and chemical-thermal treatments; flame-hardening of surface to increase wear resistance; heat resistance and strength properties of alloyed nodular cast iron. Graphs, micrographs, photographs. 7 ref. (Q8, Q general, J2, CI)

333-Q. (German.) **Effect of Cold Working and Ageing on the Tensile Strength and Toughness of Air-Refined Low Carbon Special Steels.** Alfred Kruger. *Stahl und Eisen,* v. 74, no. 27, Dec. 30, 1954, p. 1757-1766.

Forming characteristics of oxygen-steam and oxygen-air blown steels compared with regular process bessemer, openhearth, and electric rimmed and killed steels. Tables, graphs. 16 ref. (Q23, D3, CN)

334-Q. (German.) **Relation Between Structure and Behavior of Austenitic Chromium-Molybdenum-Nickel Steels in Long-Time Tests at Elevated Temperatures.** Karl Bungardt and Heribert Sychrovsky. *Stanl und Eisen,* v. 75, no. 1, Jan. 13, 1955, p. 25-39 + 2 plates.

Effects of molybdenum, columbium and nickel contents; type and degree of prior treatments on high temperature mechanical properties. Tables, micrographs, graphs, 25 ref. (Q general, SS)

335-Q. (German.) **Theory and Application of Photo-Elasticity in the Elastoplastic Field.** R. Hiltscher. *VDI Zeitschrift,* v. 97, no. 2, Jan. 11, 1955, p. 49-58.

Development of photo-elastic method; expansion of flow range and its effect on stress distribution in elastic ranges for two-dimensional states of stress and deformation; limitation of three-dimensional problems to flow-range determination. Graphs, table, diagrams, stress patterns. 13 ref. (Q25)

336-Q. (Russian.) **Investigation of the Structure of Grains in Fractures of Unmodified and Modified Cast Irons.** A. V. Bobrov and S. T. Kiselev. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 20-22.

Effects of grain size in gray and magnesium treated irons. Micrographs, refractograms. 3 ref. (Q26, M27, CI)

337-Q. (Russian.) **Dependence of the Strength of Threaded Joints on the Hardness of the Material in the Bolts and Pins.** A. I. Iakushev. *Vestnik Mashinostroeniia,* v. 34, no. 12, Dec. 1954, p. 3-6.

Chromium-nickel steel is recommended for static loading, with a hardness of Rockwell C-36 and up and for dynamic loading, with a hardness not exceeding Rockwell C-32 to 36. Tables, diagrams, graphs. (Q28, Q23, AY)

338-Q. Graphical Representation of the Spherical Propagation of Explosive Pulses in Elastic Media. Werner Goldsmith and William A. Allen. *Acoustical Society of America, Journal,* v. 27, Jan. 1955, p. 47-55.

Data from IBM calculations for displacements, velocities and stresses generated in a metal by an explosion. Graphs, tables. 6 ref. (Q25)

339-Q. The Physical and Computing Significance of an Electrical Analogue of Creep and Recovery. A. J. Kennedy. *British Journal of Applied Physics,* v. 6, Feb. 1955, p. 49-58.

A voltage program to simulate the stressing, and the charge taken by the network is integrated and recorded as the creep strain analog. Graphs, table, circuit diagram. 24 ref. (Q3)

340-Q. Mechanical-Metallurgical Improvements in Drill Steel. T. W. Wlodek. *Canadian Mining and Metallurgical Bulletin,* v. 48, no. 514, Feb. 1955, p. 84-90; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 58, 1955, p. 52-58.

Strength and deformation characteristics of drill steels; requirements for various types of ore drilling. Diagrams, table, graphs. 10 ref. (Q23, Q24, T6, TS)

341-Q. Recent Studies of Metallic Friction. F. P. Bowden. *Chartered Mechanical Engineer,* v. 2, Feb. 1955, p. 86-101.

Mechanism of friction, metal transfer, surface temperature of sliding solids. Micrographs, photographs, diagrams, graphs, tables. 25 ref. (Q9)

342-Q. Stress Concentration Factors. Relating Theoretical and Practical Factors in Fatigue Loading. R. B. Heywood. *Engineering,* v. 179, Feb. 4, 1955, p. 146-148.

Causes of discrepancy between theory and practice. Methods for using theoretical data in design. Graphs, diagrams. 6 ref. (Q7)

343-Q. Stresses in Plates With Cracks and Notches. A Theoretical and Experimental Investigation. M. Rothman and D. S. Ross. *Engineering,* v. 179, Feb. 11, 1955, p. 175-180.

Mathematical analysis and photoelastic stress determinations. Graphs, photographs, diagrams. 10 ref. (Q25)

344-Q. The Effect of Fluid Pressure on the Shear Properties of Metals. B. Crossland. *Institution of Mechanical Engineers, Proceedings,* v. 168, no. 40, 1954, p. 935-944 + 2 plates; disc., p. 944-946.

Torsion tests carried out under fluid pressures of 20 to 40 tons per sq.in. Diagrams, photographs, graphs. 15 ref. (Q1)

345-Q. Research Points Way to New Methods of Preventing Galling and Seizing. I-II. E. S. Machlin. *Iron Age,* v. 175, Feb. 10, 1955, p. 91-93; Feb. 17, 1955, p. 104-106.

Influence of film nature and hardness of supporting matrix on behavior of bearings. Tables, graphs. 10 ref. (Q9, Ti, Ag, Fe, Cu, Al)

346-Q. Relationships Between Long and Short-Time Creep and Tensile Properties of a Commercial Alloy. A. Graham and K. F. A. Walles. *Iron and Steel Institute, Journal,* v. 179, Feb. 1955, p. 105-120.

Experimental data on Nimonic-80 are used to develop a deformation theory. Graphs, tables. 23 ref. (Q3, Q27, Ni, Cr, Co)

347-Q. Deformation of Iron Crystals by Unidirectional Abrasion. R. P. Agarwala and H. Wilman. *Iron and Steel Institute, Journal,* v. 179, Feb. 1955, p. 124-131 + 2 plates.

Abrasion on different crystal faces caused rotation around various axes. Layers of different crystal structures were found in the deformed region. Diffractograms, graphs, tables. 10 ref. (Q9, Fe)

348-Q. Internal Friction of Metal Single Crystals. Johannes Weertman. *Journal of Applied Physics,* v. 26, Feb. 1955, p. 202-210.

Semiquantitative calculations made of that portion of the internal friction of annealed and moderately cold worked metal single crystals which is due to dislocation motion. Tables, graphs. 22 ref. (Q22)

349-Q. Hydrogen Affects Critical Properties in Commercial Titanium. H. D. Kessler, R. G. Sherman and J. F. Sullivan. *Journal of Metals,* v. 7, Feb. 1955, p. 242-246.

Data indicate that 0.015% is the upper limit for hydrogen in commercial titanium and the alloys Ti-140A and Ti-150A. Vacuum melting and careful processing will meet this requirement. Vacuum annealing may reclaim high hydrogen material. Graphs, micrographs, photograph. 14 ref. (Q general, N8, Ti)

350-Q. Embrittlement of Molybdenum by Neutron Radiation. C. A. Bruch, W. E. McHugh and R. W. Hockenbury. *Journal of Metals,* v. 7;

American Institute of Mining and Metallurgical Engineers, Transactions, v. 203, Feb. 1955, p. 281-285.

Transition temperature was increased from −30 to 70° C. due to submicroscopic changes. Diagram, micrographs, graphs, tables. 8 ref. (Q23, P13, Mo)

351-Q. A Study of the Room Temperature Fatigue Properties of Molybdenum. W. L. Bruckart and W. S. Hyler. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 287-290.

Tests on powder-metallurgy and arc-cast wrought molybdenum show good fatigue behavior in both notched and unnotched specimens. Micrographs, tables, graphs, diagram, photographs. (Q7, Mo)

352-Q. Relation of Strength, Composition, and Grain Size of Sintered WC-Co Alloys. J. Gurland and P. Bardzil. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 311-315.

Transverse-rupture strength reaches a maximum for values of free path between carbide particles of 0.3 to 0.6 μ. Tables, graphs, micrographs, photograph. 18 ref. (Q27, M27, C-n, W, Co)

353-Q. Influence of Heat Treatment on the Ductile-Brittle Transition Temperature of Semikilled Steel Plate. R. H. Frazier, F. W. Boulger and C. H. Lorig. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 323-329.

Effects of ferrite grain size on brittleness. Diagram, tables, graphs, micrographs. 9 ref. (Q23, M27, CN)

354-Q. Isoembrittlement in Chromium and Molybdenum Alloy Steels During Tempering. Gopalkrishna Bhat and Joseph F. Libsch. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 330-335.

Data suggest two distinct modes of embrittlement with possible superposition at extended times at 1100 to 1150° F. for chromium steels. Tables, graphs. 17 ref. (Q23, AY)

355-Q. Cold-Rolled Textures of Silicon-Iron Crystals. P. K. Koh and C. G. Dunn. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 401-406.

Effects of orientation on deformation behavior. Table, pole figures, refractogram, diagram. 14 ref. (Q24, Fe, Si)

356-Q. Formation of Cold-Worked Regions in Fatigued Metal. Rayjor Webeler. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 408-411.

Ordered copper-gold wires increased in resistivity by 1 to 2% at liquid nitrogen temperature as a result of fatigue. Diagram, tables. 7 ref. (Q7, Au, Cu)

357-Q. Temper Brittleness of Some Fe-Ni-Cr Alloys. L. D. Jaffe. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 412.

Properties of SAE 3135 bar stock remelted under vacuum. Table, graphs. 7 ref. (Q23, AY)

357-Q. Hypo-Elasticity. C. Truesdell. *Journal of Rational Mechanics and Analysis,* v. 4, Jan. 1955, p. 83-133.

Theory, analysis of stress-strain relationships. Graphs, diagrams. (Q21)

358-Q. On the Concept of Concentrated Loads and an Extension of the Uniqueness Theorem in the Linear Theory of Elasticity. E. Sternberg and R. A. Eubanks. *Journal of Rational Mechanics and Analysis,* v. 4, Jan. 1955, p. 135-168.

Mathematical analysis. Theoretical considerations. Diagram. 22 ref. (Q21)

359-Q. Effect of Temperature on the Tensile Properties of a Commercial and a High-Purity 70-Percent-Nickel-30-Percent-Copper Alloy. William D. Jenkins, Thomas G. Digges and Carl R. Johnson. *Journal of Research, National Bureau of Standards,* v. 54, Jan. 1955, p. 21-36.

Tests made from 75 to 1700° F. on samples of same grain size and structure. Tables, graphs, photographs, micrographs. 10 ref. (Q23, Cu, Ni)

360-Q. Transcrystalline Decohesions Produce by Mechanically Working the Surface of Iron and Steel. Pierre A. Jacquet. *Metal Treatment and Drop Forging,* v. 22, Feb. 1955, p. 55-58.

Study of microfissures in machined surfaces. Micrographs. 5 ref. (Q26, G17, AY, Fe)

361-Q. Deformation Faults in Cold-Worked Metals. G. B. Greenough and E. M. Smith. *Physical Society, Proceedings,* v. 68, no. 421B, Jan. 1955, p. 51-52.

Experimental data for copper and aluminum-silver alloy filings. 4 ref. (Q24, Cu, Al, Ag)

362-Q. The Effect of Bending on the Mechanical Properties of Temper-Rolled Mild Steel. B. B. Hundy and T. D. Boxall. *Sheet Metal Industries,* v. 32, no. 334 Feb. 1955, p. 101-103, 108.

Aging effects explained in terms of modified residual stresses and other factors influencing the degree of strain aging; testing precautions. Graphs. 5 ref. (Q25, Q5, CN)

363-Q. Rockwell Hardness Testing of Sheet Materials. Vincent E. Lysaght. *Sheet Metal Industries,* v. 32, no. 334, Feb. 1955, p. 127-133; disc., p. 133-138.

Factors to be considered in testing various metals in several conditions. Tables, graphs, diagrams. 6 ref. (Q29)

364-Q. Fatigue of Metals—Our Knowledge and the Deficiencies in Our Knowledge. P. L. Teed. *Shell Aviation News,* 1954, no. 198, Dec., p. 16-21.

Influence of repeated stresses under various conditions; understressing, overstressing, cummulative rule. Graphs. 70 ref. (To be continued.) (Q7)

365-Q. Brittle Fracture in Steel. C. P. Oldridge. *Welding and Metal Fabrication,* v. 23, Feb. 1955, p. 55-60.

Salient points of this vital problem. Photographs, graphs, diagram. (To be continued.) (Q26, Q23, ST)

366-Q. Sigma Phase in Austenitic Stainless Steel Weldments. O. H. Henry, M. A. Cordovi and G. J. Fischer. *Welding Journal,* v. 34, Feb. 1955, p. 75S-81S.

Occurrence of sigma phase and its effects on tensile-impact properties. Tables, photographs, diagram, graphs. (Q23, Q6, M26, SS)

367-Q. Fatigue Strength of Butt Welds in Structural Steels. L. A. Harris, G. E. Nordmark and N. M. Newmark. *Welding Journal,* v. 34, Feb. 1955, p. 83S-96S.

Low-hydrogen electrodes produce joints with best fatigue properties. Tables, diagrams, photographs, graphs. 7 ref. (Q7, K1, CN)

368-Q. Filler-Metal Strengths in Brazed Copper Joints. W. H. Munse and D. C. Crawford. *Welding Journal,* v. 34, Feb. 1955, p. 105S-111S; disc., p. 111S.

Test data for six filler metals at various temperatures. Diagrams, tables, photographs, graph, micrographs. 13 ref. (Q23, K8, Cu)

369-Q. (English.) Effect of Arsenic, Copper, Tin and Molybdenum on Impact Properties of Steels. Hiroshi Sawamura and Toshisada Mori. *Kyoto University, Memoirs of the Faculty of Engineering,* v. 16, no. 4, Oct. 1954, p. 205-227.

Charpy tests on forged bars from 47 experimental melts at temperatures up to 900° C. show effects of composition on grain size, hardness, microscopic structures and impact resistance. Tables, diagrams, graphs, micrographs. 18 ref. (Q6, CN)

370-Q. (English.) Researches on the Fatigue Deformation. Minoru Kawamoto and Kunio Nishioka. *Kyoto University, Memoirs of the Faculty of Engineering,* v. 16, no. 4, Oct. 1954, p. 228-252.

Deformation during fatigue loading as a function of load, stress distribution and yield properties of the steel. Graphs, tables, diagram. 5 ref. (Q7, CN)

371-Q. (English.) A Theory of Slip-Band Formation and Work-Hardening in Face-Centred Cubic Metal Crystals. Taira Suzuki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 4, Aug. 1954, p. 309-323.

Dislocation source elements remaining in an annealed crystal are sources for dislocation spirals. Diagrams, graphs. 42 ref. (Q24, M26)

372-Q. (English.) A Note on a Theory of the Uniaxial Ferromagnetic Anisotropy Induced by Cold Work or by Magnetic Annealing in Cubic Solid Solutions. Satoshi Taniguchi and Mikio Yamamoto. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 4, Aug. 1954, p. 330-332.

Explained by anisotropy energy from anisotropic distribution of solute atoms. Graph. 5 ref. (Q24, P16)

373-Q. (English.) Production of Single Crystals of Iron-Aluminium Alloys by the Strain-Anneal Method. Mikio Yamamoto and Ryofu Miyasawa. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 4, Aug. 1954, p. 333-342.

Alloys of less than 6% aluminum studied for best decarburization, elongation working, recrystallization annealing and macro-etching qualities. Tables, diagram. 27 ref. (Q24, Al, Fe)

374-Q. (French.) Application of Microphotoelastometry to the Study of Plastic Deformation. Marcel Bonvalet. *Comptes rendus,* v. 240, no. 2, Jan. 10, 1955, p. 157-158.

Tensile tests on metallic specimens coated by ethoxy resin, utilizing the local birefringence of the varnish. (Q25)

375-Q. (French.) Effect of High-Temperature Oxidation on the Chemical Composition of the Surface of a Nickel-Chromium-Titanium-Aluminium Alloy. Frima Malamand and Georges Vidal. *Comptes rendus,* v. 240, no. 2, Jan. 10, 1955, p. 186-188.

Spectrographic technique to determine surface impoverishment by selective oxidation by titanium and aluminum. Explains the stress-rupture properties. Graphs. 4 ref. (Q4, R2, Ni, Cr)

376-Q. (French.) Relationship Between the Structure and Tensile Properties of Sand-Cast Tin Bronzes. Pierre-Julien Le Thomas. *Fonderie,* 1955, no. 108, Jan., p. 4320-4329.

Rule for determining relationship between alpha-delta structure and tensile properties of tin bronzes; influence of phosphorus. Micrographs, diagrams, tables, graphs. 8 ref. (Q23, M27, Sn, Cu)

377-Q. (French.) **Influence of Iron and Manganese on A-S13 (Alpax) Type Alloys.** Claude Mascré. *Fonderie,* 1955, no. 108, Jan., p. 4330-4336.

Studies methods of combatting injurious influence of iron in aluminum-silicon alloys, and quantitative relationship needed between iron and manganese. Micrographs, charts, graphs, table. 3 ref. (Q general, M27, Fe, Mn)

378-Q. (French.) **Improvement of the Fatigue and Corrosion Behavior of Piston-Engine Valve Springs.** M. R. Chevalier. *Technique et science aéronautiques,* 1954, no. 5, p. 348-353.

Results of tests on the influence of surface state on fatigue behavior, and on improving protection against corrosion. Micrographs, table, photograph. (Q7, R general)

379-Q. (German.) **Problem of Intrinsic Stresses in Rods Under Static Load.** Hans Bühler. *Archiv für das Eisenhüttenwesen,* v. 26, no. 1, Jan. 1955, p. 51-54.

Effect of static tensile and compression stresses on change of residual stress in normally annealed and refined structural steels. Tables, graphs, diagram. 18 ref. (Q25, CN)

380-Q. (German.) **The Strain-Gage Process. IV. Electrical Measuring Technique.** C. Rohrbach. *Archiv für technisches Messen,* 1955, no. 229, Feb., p. 41-44.

Basic circuits for measuring stresses with a.c. and d.c. currents. Diagrams. 11 ref. (Q25)

381-Q. (German.) **Hardness and Wear Resistance of Electroplated Coatings.** R. Weiner and G. Klein. *Metalloberfläche,* Ausgabe B, v. 7, no. 1, Jan. 1955, p. 1-7.

Correlation between micro-indention hardness, scratch hardness and resistance to abrasion; comparative tests with different plating baths. Tables, graphs. 7 ref. (Q29, Q9, L17)

382-Q. (German.) **TOR-Steel 40 at High Temperatures.** Stephan Soretz. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 21, no. 1, Jan. 1955, p. 3-7.

Details and results of tensile tests and effects of stresses at various temperatures. Graphs, tables. 5 ref. (Q23, Q27, ST)

383-Q. (German.) **Some Applications of the Cylindrical Shell Theory.** Walter Wuest. *Zeitschrift für angewandte Mathematik und Mechanik,* v. 34, no. 12, Dec. 1954, p. 444-454.

An extension of the theory to open divisions of shells for cases of uniform stress distribution along one direction, and applied to cross-curved leaf and bimetallic cylinder springs. Diagrams, graphs, table. 9 ref. (Q25)

384-Q. (German.) **A New Process for Evaluating Plane Photoelasticity.** L. Föppl. *Zeitschrift für angewandte Mathematik und Mechanik,* v. 34, no. 12, Dec. 1954, p. 454-459.

Orthogonal lines of principal stress are used as coordinate lines to describe the plane state of stress. Graphs. 2 ref. (Q25)

385-Q. (German.) **Comparison of Internal Stresses in Ferromagnetic Metals Determined by X-Ray and Magnetism.** Ludwig Reimer. *Zeitschrift für angewandte Physik,* v. 6, no. 11, Nov. 1954, p. 489-494.

Extension of method of reversible magnetization energy to determine internal stresses in iron reveals good agreement with the internal stresses determined from the line displacements in X-ray recordings. Graphs. 10 ref. (Q25, Ni, Fe)

386-Q. (German.) **Internal Stresses After Plastic Tensile Deformation.** Viktor Hauk. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 33-38.

X-ray measurements on surface of slightly stretched flat steel and aluminum alloy bars. Two types of internal stress are ascribed to elastic anisotropy and heterogeneity in a heterogeneous structure. Tables, micrographs, graphs. 30 ref. (Q25, AY, CN, Al)

387-Q. (German.) **X-Ray Investigations of the Effect of Carbon Content on Internal Bending Stresses in Steel and Iron.** Ludwig Reimer. *Zeitschrift für Metallkunde,* v. 46, no. 1, Jan. 1955, p. 39-42.

Slight plastic bending of pure iron and steel bars with 0.35 and 0.6% carbon reveals an increase of internal stresses with increasing carbon content. Table, diagram, micrograph, graphs. 20. ref. (Q25, Q5, Fe, CN)

388-Q. (Russian.) **Forces of Bonding and the Static Distortions in Crystals of Alloyed Ferrite.** V. A. Il'ina and V. K. Kritskaia. *Doklady Akademii Nauk SSSR,* v. 100, no. 1, Jan. 1, 1955, p. 69-72.

Role of formation of submicroscopic nonhomogeneity in connection with mechanical working and heat treatment. Tables, graphs. 8 ref. (Q24, M26, J general, Fe, Mo, Co, Mn, Nb, V)

389-Q. (Russian.) **Diagram of Composition Versus Heat Resistance for Alloys of the Binary Nickel-Tungsten System.** I. I. Kornilov and P. B. Budberg. *Doklady Akademii Nauk SSSR,* v. 100, no. 1, Jan. 1, 1955, p. 73-75.

Diffusion processes affecting creep; physico-chemical theory of high-temperature strength of solid solutions. Graphs. 8 ref. (Q3, Q23, N1, Ni, W)

390-Q. (Russian.) **Mechanical Properties and Microstructure of Bronzes Br. Ots-10-2 and Br. OS-10-10.** A. A. Iurgenson and N. A. Zernova. *Liteinoe Proizvodstvo,* 1955, no. 1, Jan., p. 24-25.

Microstructural and strength analysis of leaded bronze. Tables, diagrams, graphs, micrographs. 3 ref. (Q23, M27, Cu, Sn, Pb)

391-Q. (Russian.) **Effect of Heat Treatment on Fatigue Strength of Steel During Atmospheric Corrosion.** A. V. Riabchenkov and E. L. Kazimirovskaia. *Vestnik Mashinostroeniia,* v. 35, no. 1, Jan. 1955, p. 69-72.

Case-hardening, normalizing, microstructures. Graphs, table, micrographs. 6 ref. (Q7, J28, J24, R3, ST)

392-Q. (Russian.) **Choice of Structure of Steel for Parts Operating Under Cyclic Stresses.** I. L. Mirkin and E. D. Tsypkina. *Vestnik Mashinostroeniia,* v. 35, no. 1, Jan. 1955, p. 72-75.

Medium-carbon low-alloy steels have structures more resistant to fatigue than low-carbon high-alloy steels. Tables, graphs, sketch. 2 ref. (Q7, M27, AY)

393-Q. (Russian.) **Investigation of the Strength of Solids. II. Relation of Rupture Life to Stress.** S. N. Zhurkov and E. E. Tomashevskii. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 1, Jan. 1955, p. 66-73.

Testing techniques. Effect of strain rate and stress on metals and plastics. Oscillograms, circuit diagram, diagrams, graph, table. 16 ref. (Q4, Al, Zn)

394-Q. (Russian.) **Temperature and Grain Size Dependence of Strength of Tungsten Carbide-Cobalt Cermets.** G. S. Kreimer, O. S. Safonova and A. I. Baranof. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 1, Jan. 1955, p. 117-124.

Testing equipment and technique, microstructural characteristics. Graphs, micrographs, tables, diagram. 4 ref. (Q23, M27, W, Co)

395-Q. (Swedish.) **Phenomenon of Hydrogen Embrittlement During Arc Welding.** Tore Norén and Stig-Erik Erikson. *Svetsaren,* v. 19, nos. 2-3, 1954, p. 3-19, 22.

Review of experimental and theoretical data. Graphs, micrographs, photographs. 59 ref. (Q23, K1, ST)

396-Q. (Swedish.) **Derivation of Equation for Equivalent Stresses by the Deviation Hypothesis.** Carl T. Ingwall. *Svetsaren,* v. 19, nos. 2-3, 1954, p. 20-22.

Conditions for start of yield in welded structures as a function of conditions in the tensile test. Graph. (Q27)

397-Q. Ductility of Vacuum Heat-Treated Molybdenum Wires. W. E. Few and G. K. Manning. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 343-344.

Low ductility results from slow heating through the range of 3000 to 3300° F. Tables. 2 ref. (Q23, Mo)

398-Q. Effect of Zinc Content on the Rolling Texture and Annealing Texture of Alpha Brass. Alfonso Merlini and Paul A. Beck. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 385-393.

Gradual changes in annealing texture explained qualitatively by the oriented growth theory. Graph, tables, pole figures. 15 ref. (Q24, N5, Cu, Zn)

399-Q. Mechanical Properties of Welded 356 Aluminum Castings. Walter S. Tenner. *Welding Journal,* v. 34, Feb. 1955, p. 128-136.

Postweld heat treatment permits welding of this alloy. Photographs, tables, micrographs, diagrams. (Q general, K general, Al)

400-Q. Stress Distribution in Side Fillet Welded Plates. P. J. Palmer. *British Welding Journal,* v. 2, Feb. 1955, p. 55-60.

Comparison of calculated and measured stresses shows good agreement. Diagrams, graphs. 9 ref. (Q25, K6)

401-Q. Fatigue Life of Stranded Hook-Up Wire. Donald C. Alexander. *Wire and Wire Products,* v. 30, Feb. 1955, p. 181-185, 221.

Vibration testing to simulate service conditions; variables which can be controlled. Photographs, tables. (Q7, Al, Cu)

402-Q. (English.) **The Internal Friction of Dilute Alloys of Lead.** J. Weertman and E. I. Salkovitz. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 1-9.

Effects of strain amplitude, temperature and ratio of atom sizes on internal friction, modulus of elasticity and critical shear stress in 0.01 to 0.1% bismuth, tin or cadmium alloys. Diagram, graphs, tables. 27 ref. (Q22, Q21, Pb, Bi, Sn, Cd)

403-Q. (English.) **The Yield Phenomena, Kink Bands and Geometric Softening in Titanium Crystals.** A. T.

Churchman. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 22-29.

Explanation of dicontinuities in stress-strain relationships of titanium containing 0.1 wt.% oxygen and nitrogen. Graphs, micrographs. 26 ref. (Q23, Ti)

404-Q. (English.) **On Deformation by Twinning.** F. C. Frank and N. Thompson. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 30-33.

Distinction between strain due to complete twinning and the macroscopic strain due to formation of a thin lamella. Pole diagrams. 4 ref. (Q24)

405-Q. (English.) **Indentation Figures on Single Crystals. I.** E. Votava, S. Amelinckx and W. Dekeyser. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 89-94.

Explanation of deformation figures observed on cleavage faces of mica and NaCl crystals. Drawings, interferograms, refractograms. 5 ref. (Q24)

406-Q. (English.) **Sub-Grain Formation in Aluminum Deformed at −183°** C. A. Kelly and W. T. Roberts. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 96-97.

X-ray microbeam study of 99.99% pure aluminum. Refractograms. 5 ref. (Q24, Al)

407-Q. (English.) **Electron Mircoscope Study of Slip Bands in Radiation-Damaged Aluminum Crystals.** E. M. Kelly. *Acta Metallurgica,* v. 3, no. 1 Jan. 1955, p. 101-102.

Irradiation and straining at −196° C. increased the amount of slip on a given plane; straining at room temperature showed no effects of irradiation. Micrographs. 2 ref. (Q24, Al)

408-Q. (English.) **Internal Friction in Titanium and Titanium Oxygen Alloys.** H. H. Bleakney. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 103-104.

Shows that stress relaxation across grain boundaries cannot explain rapid drop in modulus of elasticity at elevated temperatures. Tables. 2 ref. (Q21, Q22, Ti)

409-Q. (English.) **Note on the Temperature Dependence of Hardness of the Transition Metal Monocarbides.** J. H. Westbrook. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 104-106.

Comparison of various theoretical expressions and experimental data. Graphs. 17 ref. (Q29)

410-Q. (English.) **Internal Friction of Interstitial Solid Solutions of Oxygen and Nitrogen in Vanadium.** J. T. Stanley and C. A. Wert. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 107-108.

Effects of carbon, nitrogen and oxygen on damping peaks in ductile vanadium. Graphs. 5 ref. (Q22, V)

411-Q. (English.) **A Dislocation Model for the Origin of Fracture Cracks in Metal Crystals.** J. C. Fisher. *Acta Metallurgica,* v. 3, no. 1, Jan. 1955, p. 109-110.

Combined movements of screw and edge dislocations can start a crack only if a normal stress is present across the screw dislocation. Diagrams. (Q26)

412-Q. (Russian.) **Equations for the Theory of Plasticity.** V. V. Sokolovskii. *Prikladnaia Matematika i Mekhanika,* v. 19, no. 1, Jan.-Feb. 1955, p. 41-54.

Formulation of basic relations among components of stress and rate of deformation; equations of plane plastic equilibrium and transformation. 3 ref. (Q23)

413-Q. (Pamphlet.) **Study of Hard Coating for Aluminum Alloys.** Cornell Aeronautical Laboratory, Inc. PB 111320 S, 1953, 23 p. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.75.

Treatments to reduce effects of oxide coatings on fatigue strength; corrosion resistance of treated coatings. (Q7, R general, L14, Al)

414-Q. (Book.) **Fatigue of Aluminum.** R. L. Templin. 59 p. 1954. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Fatigue properties of various alloys and factors to be considered in design applications. (Q7, Al)

415-Q. (Book.) **Report on the Elevated-Temperature Properties of Selected Super-Strength Alloys.** Ward F. Simmons and Howard C. Cross. ASTM Special Technical Publication No. 160. 208 p. 1954. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $3.50.

Graphical summary of high-temperature mechanical properties of 13 alloys with brief descriptions including compositions, heat treatments, and processing data. (Q general, SG-h)

416-Q. (Book.) **Symposium on Effect of Temperature on the Brittle Behavior of Metals With Particular Reference to Low Temperatures.** ASTM Special Technical Publication No. 158. 474 p. 1954. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Includes 26 papers covering occurrence, theory, and control of brittle fracture of steels and cast iron. Papers are abstracted individually. (Q23, Q26, ST, CI)

R Corrosion

116-R. Galvanic Corrosion in Underground Steel. T. R. B. Watson. *Canadian Metals,* v. 18, Feb. 1955, p. 18-20.

Fundamentals of corrosion; role of electricity in corrosion; prevention practices. Diagrams. (R1, CN)

117-R. Resurgent Corrosion Fighter. *Chemical Engineering,* v. 62, Feb. 1955, p. 140-142.

Solvay re-examines sodium nitrite's properties as a corrosion inhibitor, boost sales many fold in less than 5 yr. Photograph. (R10)

118-R. Catastrophic Corrosion Resulting From Vanadium Pentoxide in Fuel Oil Ash. Anton deS. Brasunas. *Corrosion,* v. 11, Jan. 1955, p. 17-18.

Relative merits of nickel-rich and nickel-free alloys for gas turbines, boiler tubes and burners. Sources of vanadium in fuel oils; effects of additives. Diagrams, photographs. 10 ref. (R7, Ni)

119-R. Laboratory Evaluation of Inhibitors for Sweet Gas-Condensate Wells. P. J. Raifsnider, R. S. Treseder and Aaron Wachter. *Corrosion,* v. 11, Jan. 1955, p. 19-21.

Good correlation of screening tests and field trial experience. Photograph, diagram, tables. 1 ref. (R10)

120-R. Effect of Minor Constituents on the Intergranular Corrosion of Austenitic Stainless Steels. J. J. Heger and J. L. Hamilton. *Corrosion,* v. 11, Jan. 1955, p. 22-26.

Metallographic tests indicate precipitation of minor elements at grain boundaries in cause of failure of steels with less than 0.02% carbon. Graphs, micrographs. 3 ref. (R2, SS)

121-R. Effect of Design, Fabrication and Installation on the Performance of Stainless Steel Equipment. James A. Collins. *Corrosion,* v. 11, Jan. 1955, p. 27-34; disc., p. 34.

Prevention of concentration-cell, stress-corrosion and thermal fatigue of chemical process equipment. Table, diagrams, photographs, micrographs. 9 ref. (R1, Q7, SS)

122-R. Corrosion Aspects of the Vanadium Problem in Gas Turbines. S. H. Frederick and T. F. Eden. *Corrosion,* v. 11, Jan. 1955, p. 35-45; disc., p. 45-49.

Effects of vanadium pentoxide and mixtures of it with sodium sulfate on heat resisting materials; benefits of additives in the fuel oil. Tables, micrographs, photographs, graphs, 11 ref. (R9, SG-h)

123-R. Notes on a System for Rating Pitting Corrosion. Russell W. Henke. *Corrosion,* v. 11, Jan. 1955, p. 50-52.

System uses a 10-digit number to describe depth, diameter, area, nature of pit walls and time of exposure. Photograph, diagrams. (R2)

124-R. Cathodic Protection of Open Box Coolers, J. P. H. Zutphen. *Corrosion,* v. 11, Jan. 1955, p. 53-56.

Use of graphite anodes to protect exterior surfaces of steel tubes used to cool ammonia gas. Tubes were exposed to brackish sea water. Diagrams, graphs. (R10, R4, ST)

125-R. Important Advantages of Titanium in the Chemical Industry. W. G. Renshaw and Perry R. Bish. *Corrosion,* v. 11, Jan. 1955, p. 57-62; disc., p. 62-63.

Unusual passivity under certain severe conditions is leading to increased use in chemical equipment. Explanation of behavior in dry halogens. Graphs. 11 ref. (R6, T29, Ti)

126-R. Use of Organic Inhibitors in Refinery Distillation Process Equipment. G. E. Purdy. *Corrosion,* v. 11, Jan. 1955, p. 64-67.

Recommendations for reducing losses due to attack by hydrogen sulfide, hydrochloric acid, organic acids and salts. Graph, table, photographs. (R10)

127-R. A Technique for Installing Carbon Anodes in Cable Ducts. Edward J. Doyle. *Corrosion,* v. 11, Feb. 1955, p. 17-18.

Development and use of graphite anodes in cathodic protection of underground cables. Diagram, photographs. (R10, Pb)

128-R. Use of High Molecular Weight Corrosion Inhibitors in Petroleum Refineries. H. Howard Bennett. *Corrosion,* v. 11, Feb. 1955, p. 19-26; disc., p. 26-27.

Evaluation procedures. Results of 2-yr. test program. Photographs, diagrams, graphs, tables. (R10)

129-R. A New Method for Measuring Potentials of Polarized Electrodes in Soil Corrosion Cells. W. Neighbours. *Corrosion,* v. 11, Feb. 1955, p. 28-30.

Method of interrupting current through a soil corrosion cell and of measuring potentials of the polarized electrodes during period of interruption. Diagrams, photographs. 3 ref. (R8)

130-R. Corrosion and Erosion-Corrosion of Some Metals and Alloys by Strong Nitric Acid. J. F. Willging, J. P. Hirth, F. H. Beck and M. G. Fontana. *Corrosion,* v. 11, Feb. 1955, p. 31-39.

Stainless steels and aluminum al-

loys were tested in the temperature range of room temperature to 160° F. Diagrams, photographs, graphs, tables. 15 ref. (R5, Al, SS)

131-R. Proposed Methods for Cathodic Protection of Composite Structures. M. Unz. *Corrosion,* v. 11, Feb. 1955, p. 40-43.

Analysis of drainage, blocking and rectifier circuits. Examples. Diagrams. 2 ref. (R10)

132-R. Corrosion of Aircraft Structural Materials by Agricultural Chemicals. I. Laboratory Tests With Fertilizer Compounds. T. Marshall and L. G. Neubauer. *Corrosion,* v. 11, Feb. 1955, p. 44-52.

Studies of corrosion during aerial application of chemicals. Preventive measures. Tables, photograph, micrographs. 7 ref. (R6, CN, Al, Mg)

133-R. Some Remarks on Stress Corrosion Testing. Hugh P. Godard and J. J. Harwood. *Corrosion,* v. 11, Feb. 1955, p. 53-58.

Influence of specimen and test environment factors on results. Graphs, photographs, diagram. 33 ref. (R1)

134-R. Tentative Standard Method for Measuring Electrical Conductance of Coating on Buried Pipe Lines. *Corrosion,* v. 11, Feb. 1955, p. 59-62.

Definitions, test conditions and set up, instruments, procedures, calculations and methods of reporting results. Diagrams, graphs. 3 ref. (R8, R11, P15, CN)

135-R. Principles of Corrosion. III. Prevention of Corrosion. W. H. J. Vernon. *Corrosion Prevention and Control,* v. 2, Jan. 1955, p. 19-28, 44.

General review of methods based on modifications of design, materials or environment. Diagrams, table, graphs. (R general)

136-R. Corrosion of Tinplate by Foods Packed in Cans. I. Denis Dickinson. *Corrosion Technology,* v. 2, Jan. 1955, p. 4-7.

Effects of fabrication and canning procedures; effect of coating thickness on storage life. Photographs, diagrams, 6 ref. (To be concluded.) (R7, Sn)

137-R. Polarization Studies of Copper, Nickel, Titanium, and Some Copper and Nickel Alloys in Three Per Cent Sodium Chloride. H. B. Bomberger, F. H. Beck and M. G. Fontana. *Electrochemical Society, Journal,* v. 102, Feb. 1955, p. 53-58.

Relationships between potential, time, current, corrosion rate and solution velocity. Diagram, tables, graphs. 11 ref. (R11, Cu, Ni, Ti)

138-R. Effect of Oxygen, Chlorides, and Calcium Ion on Corrosion Inhibition of Iron by Polyphosphates. H. H. Uhlig, D. N. Triadis and M. Stern. *Electrochemical Society, Journal,* v. 102, Feb. 1955, p. 59-66.

Corrosion data indicate that sodium polyphosphates inhibit by favoring passivation by absorbed oxygen. A critical supply of oxygen is required. Diagram, graphs, table. 24 ref. (R10, ST)

139-R. The Crystallographic Dependence of the Oxidation Potential of Solid Copper. W. E. Tragert and W. D. Robertson. *Electrochemical Society, Journal,* v. 102, Feb. 1955, p. 86-94.

Dependence of oxidation potentials on various crystallographic planes exposed to the active medium. Tables, graphs. 26 ref. (R2, Cu)

140-R. The Corrosion of Tin by Aqueous Solutions of Ammonia. S. C. Britton and D. G. Michael. *Journal of Applied Chemistry,* v. 5, Jan. 1955, p. 1-9.

Conditions for prevention of attack; inhibitor additions. Tables, graph. 5 ref. (R5, R10, Sn)

141-R. The Corrosion of Tin in Solutions of Sodium Alkyl Sulphates. T. K. Roos. *Journal of Applied Chemistry,* v. 5, Jan. 1955, p. 10-18.

Mechanism of pitting corrosion in solutions containing surface active agents. Graphs, micrographs. 22 ref. (R2, R5, Sn)

142-R. Give Corrosion a Run for Your Money. *Steel,* v. 136, Jan. 24, 1955, p. 74-75.

Corrosion resistance of zirconium. Photographs. (R general, Zr)

143-R. Attack of Iron-Saturated Molten Zinc on Iron. D. Horstmann. *Henry Brutcher Translation no.* 3355, 15 p. Henry Brutcher, Altadena, Calif. (Slightly abridged from *Stahl und Eisen,* v. 73, no. 10, 1953, p. 659-665.)

Previously abstracted from original. See item 275-R, 1953. (R6, L16, Fe, Zn)

144-R. (French.) Optical Study and Continuous Recording of the Corrosion of Silver by Iodine Vapor. Georges Colange and René Dubrisay. *Comptes rendus,* v. 239, no. 23, Dec. 8, 1954. p. 1629-1631.

Hypothesis concerning the difference between the first and the subsequently formed corrosion rings. Photographs. 4 ref. (R6, Ag)

145-R. (French.) Mechanism of Anodic Attack of Copper. René Audubert. *Comptes rendus,* v. 239, no. 25, Dec. 20, 1954, p. 1792-1795.

Kinetic theory of overvoltage makes it possible to explain the mechanism of anodic dissolution of copper in an acid medium. Graphs. 2 ref. (R1, Cu)

146-R. (German.) Fretting Corrosion as a Cause of Fracture of Shrunk-On Crankshafts of Large Piston Engines. Franz Jaklitsch. *Stahl und Eisen,* v. 75, no. 2, Jan. 27, 1955, p. 97-98.

Reduction of fatigue strength by combined abrasion and corrosion. Table, photographs. 3 ref. (R1, Q7, ST)

147-R. (Italian.) Study of Metallic Oxidation by Change of Weight. IV. Copper-Zinc Alloys. N. Collari and P. Spinedi. *Metallurgia italiana,* v. 46, no. 11, Nov. 1954, p. 403-409.

Weight-time curves were used to determine relationship between composition and oxidation of several alloys. Graphs. 19 ref. (R2, Cu, Zn)

148-R. (Italian.) Hot Oxidation of Iron. V. Montoro. *Metallurgia italiana,* v. 46, no. 11, Nov, 1954, p. 410-412.

Two types of behavior noted as function of temperature. Analysis does not allow for phase changes. Graph. 4 ref. (R2, Fe)

149-R. Principles of Corrosion. IV. Prevention of Corrosion. W. H. J. Vernon. *Corrosion Prevention and Control,* 2, Feb. 1955, p. 21-29.

Resistance improved by purifying and alloying. Coatings of reaction product, organics, inorganics and metals for control. Table, graphs, diagram. 10 ref. (R general, L general)

150-R. Oxidation of Cobalt Metal. R. E. Carter, F. D. Richardson and C. Wagner. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Feb. 1955, p. 336-343.

Oxidation occurs by outward diffusion of cobalt through the oxide. Calculated and measured oxidation rates are in agreement. Tables, photograph, graphs, micrograph. 17 ref. (R2, Co)

151-R. Controlling Corrosion in Aluminum Fabrication. II. M. J. Pryor. *Light Metal Age,* v. 12, Feb. 1955, p. 13-16, 33.

Design considerations for avoiding conditions leading to corrosion damage. Diagrams. (R general, Al)

152-R. Oil Refineries and Corrosion by Water. Methods of Prevention. P. W. Sherwood. *Petroleum,* v. 18, Feb. 1955, p. 50-53.

Three principal variables determine the degree of corrosiveness where attack by water is involved and six major methods are recognized for its control. (R4, ST)

153-R. Protect Steel Tanks From Corrosion. Harry J. Keeling. *Petroleum Refiner,* v. 34, Feb. 1955, p. 140-142.

Corrosion can virtually be eliminated by insulating metal with protective coating or applying cathodic protection current to submerged metal. Photographs, diagram. (R10, L general, Pt, Fe, Al, Mg)

154-R. (English.) Corrosion of Metals by Acid River Water. I. Theoretical Consideration of Corrosion of Iron and Steel. Saburo Shimodaira. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 5, Oct. 1954, p. 431-445.

Determination of rate and type of corrosion by stagnant and flowing water. Tables, graphs. 21 ref. (R4, Fe, CN)

155-R. (French.) Sea Water Corrosion of Steel Pieces. G. Dechaux and E. Segol. *Métaux, Corrosion-Industries,* v. 29, no. 352, Dec. 1954, p. 469-482.

Experimental data on the functioning of corrosion cells in an alkaline and aerated medium. Photographs, micrographs, graphs. (R4, ST)

156-R. (German.) Corrosion Studies. I. Polarographic Observation of Metal Corrosion. I. Sekerka and J. Vorlicek. *Collection of Czechoslovak Chemical Communications,* v. 19, no. 6, Dec. 1954, p. 1335-1338.

Data do not agree with Van Rysselberghe's observations. Graphs, oscillograms. 5 ref. (R11)

157-R. (German.) Inter and Transcrystalline Corrosion and Its Testing. Friedrich-Carl Althof. *Metall,* v. 9, nos. 3-4, Feb. 1955. p. 110-120.

Principles of testing, description and evaluation of different types of test, resistance of different ferrous and nonferrous metals and alloys to inter and transcrystalline corrosion. Diagrams, graphs, photograph, tables. 36 ref. (R11, ST, EG-a)

158-R. (German.) Solid Products of Corrosion as Corrosion-Governing Elements. W. Feitknecht. *Werkstoffe und Korrosion,* v. 6, no. 1, Jan. 1955, p. 15-26.

Detailed results show manner in which solid products govern the whole corrosion process according to their constitution, formation and dispersal. Micrographs, tables, graphs, diagrams, X-ray diagram. 26 ref. (R general, Zn)

159-R. (German.) Inhibition and Inhibitors. Hellmuth Fischer. *Werkstoffe und Korrosion,* v. 6, no. 1, Jan. 1955, p. 26-31; disc., p. 31-32.

Mechanism of physical and chemical inhibition, its existence and use. Tables, diagrams. 10 ref. (R10)

160-R. (Russian.) Kinetics of Intercrystalline Corrosion of Chromium-Nickel Stainless Steels. V. Sh. Shekhtman, M. A. Vedeneeva and N. P. Zhuk. *Zhurnal Fizicheskoi Khimii,* v. 28, no. 12, Dec. 1954, p. 2199-2210 + 1 plate.

Effects of heat treatment, composition and concentration of corrosion medium, cold working and trace-element content of steel. Special electrical method of investigation. Graphs, micrographs, diagrams, tables. 18 ref. (R2, SS)

161-R. (Russian.) **Use of Fe^{59} for Investigating the Mechanism of Iron Oxidation.** B. V. Linchevskii and N. P. Zhuk. *Zhurnal Fizicheskoi Khimii*, v. 28, no. 12, Dec. 1954, p. 2265-2267.

Experimental data on distribution of activity in iron scale. Graphs, table. 5 ref. (R2, Fe)

162-R. Corrosion of Ships. A. Pickworth. *Corrosion Technology*, v. 2, Feb. 1955, p. 32-36.

Causes, protective measures, design features. Photographs. (R general, CN)

163-R. Minimizing Stress Corrosion Cracking of Cylinder Valves. Mortimer Schussler. *Corrosion*, v. 11, Mar. 1955, p. 105-108.

Corrosion tests on forged aluminum bronze valve bonnets. Design considerations. Remedial measures. Micrographs, photographs, diagrams, tables. (R1, Cu)

164-R. Corrosion Evaluation of Ship Bulkhead and Hull Plating by Audigage Thickness Measurements. Dwight J. Evans. *Corrosion*, v. 11, Mar. 1955, p. 109-113; disc., p. 113-114.

Audigage equipment and operating procedures. Photograph, diagram, tables. (R general, S14)

165-R. Corrosion of Aircraft Structural Materials by Agricultural Chemicals. II. Effect of Insecticides, Herbicides, Fungicides and Fertilizers. Charles F. Schreiber. *Corrosion*, v. 11, Mar. 1955, p. 119-130.

Corrosive and surface destruction effects of generally used agricultural chemicals on structural materials and finishes used in agricultural aircraft and dispersing equipment. Tables. (R6)

166-R. Solution of Cathodic Protection Interference Problems. Francis W. Ringer. *Corrosion*, v. 11, Mar. 1955, p. 131-138.

Determining the extent of possible interference of underground protection devices on neighboring structures which are not primarily considered as being a part of the cathodic protection system. Table. 3 ref. (R10)

167-R. Cathodic Protection Applied to a Large-Diameter Oil Pipe Line System. Dean O. Griffith. *Corrosion*, v. 11, Mar. 1955, p. 139-142.

Equipment and operation techniques. Photographs, diagrams. (R10)

168-R. Proposed Standardized Laboratory Procedure for Screening Corrosion Inhibitors for Use in Oil and Gas Wells. *Corrosion*, v. 11, Mar. 1955, p. 143-146.

A static oil and water immersion test using the weight loss of a steel coupon when under the influence of an inhibited system compared to its weight loss under an unhibited system. Table, diagram. (R10)

169-R. Localised Corrosion in Steam Boilers. I. R. N. Parkins. *Corrosion Technology*, v. 2, Feb. 1955, p. 43-46.

Types of pitting corrosion. Graphs, photographs. 10 ref. (R2)

170-R. Cathodic Protection of Underground Structures. I. W. Godfrey Waite. *Corrosion Technology*, v. 2, Feb. 1955, p. 47-49.

Theory, methods. Diagrams. (R10)

171-R. Corrosion of Tinplate by Foods Packed in Cans. II. Denis Dickinson. *Corrosion Technology*, v. 2, Feb. 1955, p. 49-51.

Corrosive effects of different fruits and vegetables. Effects of trace elements in the form of spray residues. Importance of lacquers. Table, photograph, 10 ref. (R7)

172-R. Here Is Why Pipe Lines Corrode. Maurice A. Riordan. *Pipe Line Industry*, v. 2, Mar. 1955, p. 36-39.

Corrosion mechanisms; evaluation of corrosion circuits. Diagrams. (R general)

173-R. How to Combat Internal Corrosion. Russell A. Brannon. *Pipe Line Industry*, v. 2, Mar. 1955, p. 44-49.

Corrosion protection by means of coatings and inhibitors. Photographs, diagrams, table. (R10, L general)

174-R. How to Design Cathodic Protection Systems. Wayne A. Johnson. *Pipe Line Industry*, v. 2, Mar. 1955, p. 58-60, 64.

Soil and current requirements, equipment tests and selection. Photographs, diagrams, graph. (R10)

175-R. Field Investigation of Corrosion in Alkaline Pulping Equipment. C. B. Christiansen and J. B. Lathrop. *Tappi*, v. 38, Feb. 1955, p. 122-128.

Forces which cause corrosion in digesters, recommendations for extending service life of alkaline pulping equipment. Diagrams, graphs, table. (R5)

176-R. (English.) **Effect of Electric Field on Oxidation of Copper.** H. H. Uhlig and A. E. Brenner. *Acta Metallurgica*, v. 3, no. 1, Jan. 1955, p. 108-109.

Within experimental error no effects of field strengths up to 15,500 v. observed. Graph, table. 3 ref. (R2, Cu)

177-R. (Pamphlet.) **The Action of Polar Organic Inhibitors in the Acid Dissolution of Metals.** University of Texas. PB 111451, 1953, 18 p. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.50.

Exact mechanism of inhibition. Experimental data confirm the theory. (R10)

178-R. (Book—Dutch.) **Corrosion Tests With Aluminum Alloys.** E. M. J. Mulders, W. G. R. deJager, and J. W. Boon. Pt. I-II. 63 p. 1954. Nijverheidsorganisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Netherlands.

Mechanical and chemical properties of specimens joined by various methods and of the alloys joined with steel which have been subjected to exposure and accelerated laboratory tests. (R11, Q general, Al, ST)

S
Inspection and Control

35-S. Thulium 170 for Industrial Radiography. R. Halmshaw. *British Journal of Applied Physics*, v. 6, Jan. 1955, p. 8-10.

Survey of properties and possible applications. Graphs, tables. 10 ref. (S13, S19, Tm, Al, ST)

36-S. Effect of Cold Worked Surfaces Upon Ultrasonic Echoes in Single Crystal Specimens of Lead. E. W. Kammer. *Review of Scientific Instruments*, v. 26, Jan. 1955, p. 14-15.

Cold worked surfaces distort the pulse and may lead to serious errors. Chart, diagram, table. (S13, P10, Pb)

37-S. Electrical Parasites Hamper Temperature Measurement. D. J. Pearse. *Steel Processing*, v. 41, Jan. 1955, p. 22-23, 52.

Sources of stray currents and methods of preventing their interference with thermocouple readings. Diagrams. (S16)

38-S. Ultrasonic Testing of Welds. J. D. Hislop. *Welding and Metal Fabrication*, v. 23, Jan. 1955, p. 7-13.

Possible application, limitations of method, inspection techniques. Diagrams, table, photographs. (S13)

39-S. Recent Advances in Ultrasonic Nondestructive Testing. J. Krautkrämer. *Henry Brutcher Translation no.* 3357, 11 p. Henry Brutcher, Altadena, Calif. (Slightly abridged from *Zeitschrift für Metallkunde*, v. 45, no. 4, 1954, p. 154-157.)

Previously abstracted from original. See item 263-S, 1954. (S13, ST)

40-S. A Method of Quantitative Nondestructive Testing Employing a Slip-Over Coil. A-B. F. Förster and K. Stambke. *Henry Brutcher Translation nos.* 3398-3399, 38 p. Henry Brutcher, Altadena, Calif. (Slightly condensed from *Zeitschrift für Metallkunde*, v. 45, no. 4, 1954, p. 166-179.)

Previously abstracted from original. See item 266-S, 1954. (S13, S14)

41-S. Magneto-Inductive Crack Detection in Steel. F. Förster. *Henry Brutcher Translation no.* 3401, 13 p. Henry Brutcher, Altadena, Calif. (Condensed from *Zeitschrift für Metallkunde*, v. 45, no. 4, 1954, p. 221-226.)

Previously abstracted from original. See item 266-S, 1954. (S13, S14)

42-S. Magneto-Inductive Method of Nondestructive Testing, With Consideration of the Fundamental Frequency Only. F. Förster. *Henry Brutcher Translation no.* 3406, 10 p. Henry Brutcher, Altadena, Calif. (Condensed from *Zeitschrift für Metallkunde*, v. 45, no. 4, 1954, p. 206-211.)

Previously abstracted from original. See item 270-S, 1954. (S10, P15, P16, ST)

43-S. (German.) **The Behavior of Metallic Heating Elements in Service-Life Testing.** A. Schulze and D. Bender. *Metall*, v. 9, nos. 1-2, Jan. 1955, p. 7-13.

Present status of short-time service-life testing of heating elements; equipment and methods; factors which affect test results. Photographs, table, graphs. 17 ref. (S21, Ni, Cr, Fe, Al)

44-S. (German.) **Nondestructive Testing of Metals With the Magneto-Inductive Scanning-Coil Instrument.** H. Breitfeld. *Metall*, v. 9, nos. 1-2, Jan. 1955, p. 14-22.

Determination of segregations, hardness, defects and thicknesses. Diagrams photograph, tables, graphs. 11 ref. (S13, S14)

45-S. (German.) **Ultrasonic Testing Device for Rails.** W. Kutzsche. *Nachrichtentechnik*, v. 4, no. 12, Dec. 1954, p. 544.

Russian device for indicating horizontal and oblique cracks. (S13)

46-S. (German.) **Temperature Control for Electric Heat-Treating Furnaces.** E. T. H. J. Horowitz. *Sprechsaal*, v. 88, no. 1, Jan. 1955, p. 2-5.

Design and operation of different temperature controls. Photographs, diagrams. (To be continued.) (S16, J general)

47-S. Application of Statistical Analyses for Quality Control in Steel Mills. Henry F. Myers. *American Iron and Steel Institute, Preprint*, 1954, 16 p.

Use of statistical principles for analyzing large collections of data. Graphs, table. 7 ref. (S12, D general)

48-S. High Voltage Sources for Industrial Radiography—Past and Present, and Future Trends. E. E. Charlton. *Nondestructive Testing*, v. 13, Jan.-Feb. 1955, p. 13-22.

Development of equipment, accessory devices. Photographs, diagrams, graph. 36 ref. (S13)

49-S. Theory and Application of Coil Magnetization. Glenn O. McClurg. *Nondestructive Testing,* v. 13, Jan.-Feb. 1955, p. 23-25.

Theoretical and experimental data on effective permeability of parts during magnetic particle inspection. Tables, graph. 8 ref. (S13)

50-S. Nondestructive Testing in Shipbuilding and Ship Repairs. A. K. Hutton. *Nondestructive Testing,* v. 13, Jan.-Feb. 1955, p. 27-31, 35.

Requirements, applications and usefulness of nondestructive testing methods. Photographs, radiographs. 1 ref. (S13)

51-S. Magnetic Particle, Penetrant and Related Inspection Methods as Production Tools for Process Control. Hamilton Migel. *Steel Processing,* v. 41, Feb. 1955, p. 86-91, 127.

Review of equipment, methods and uses. Photographs. (S13)

52-S. (French.) **Industrial Control by Ultrasonics. Materials and Ultrasonics. Method of Control by Transmission.** Jean Daurat. *Métallurgie et la construction mécanique,* v. 87, no. 1, Jan. 1955, p. 31, 33-34.

Theoretical basis, research into the hidden defects in the materials. Diagrams. (To be continued.) (S13)

53-S. (German.) **Accurate Temperature Measurements in Metal Melts.** Erwin Samal. *Giesserei,* v. 42, no. 2, Jan. 20, 1955, p. 36-37.

Advantages of immersion thermocouples over optical pyrometers. Design, circuit and operation of an accurate portable temperature-measuring instrument. Diagrams. 4 ref. (S16)

54-S. (German.) **The Use of Photo-Electricity in the Metal-Processing Industry.** H. D. Schulz-Methke. *Metall,* v. 9, nos. 3-4, Feb. 1955, p. 97-99.

Properties of different photo-electric cells used for quality and production control. Graph, photographs. 4 ref. (S18)

55-S. (German.) **Temperature Control of Electric Heat Treating Furnaces.** J. Horowitz. *Sprechsaal,* v. 88, no. 2, Jan. 1955, p. 23-26.

Operation principle for automatic controls; consideration of temperature of charge, furnace chamber, heating wires and recorded temperature; accuracy of control; thermal potentials of precious and base metal thermocouples. Graphs, diagram. 2 ref. (To be continued.) (S16, J general)

56-S. Inspection Keeps Pace With Modern Manufacturing Methods. W. H. Vann. *Machinery,* v. 61, Mar. 1955, p. 162-169.

Development of automatic inspection equipment for use in manufacture of automobile engines. Photographs. (S general)

57-S. (Book.) **ASTM Standards on Copper and Copper Alloys.** ASTM Committee B-5. 586 p. Sept. 1954. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. $3.75.

(S22, Cu)

58-S. (Book.) **The Handbook of Measurement and Control.** M. F. Behar, editor. 2nd Ed. 216 p. 1954. The Instruments Publishing Co., Inc., 845 Ridge Ave., Pittsburgh 12, Penna.

Designed to classify and outline operating principles and applications of laboratory, scientific, engineering, and industrial instruments. (S general)

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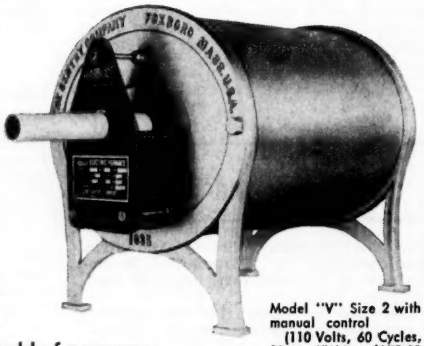

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T

Applications of Metals in Equipment

35-T. The Manufacture and Properties of Automobile Suspension Springs. C. J. Dadswell, J. E. Russell and R. Fielding. *Institution of Mechanical Engineers, Automobile Division, Proceedings,* pt. 3, 1952-1953, p. 119-128 + 2 plates; disc., p. 128-138.

Manufacture and properties of laminated, coil and torsion bar springs. Tables, photographs, graphs. 22 ref. (T7, CN)

36-T. Germanium and Silicon for Electronic Devices. Anthony S. Rugare. *Metal Progress,* v. 67, Feb. 1955, p. 87-91.

Crystals of precise and minute impurity for rugged miniature electronic devices are at present made more easily of germanium than of silicon, but silicon can operate at higher temperatures. Germanium is more efficient at high frequencies. Table, photographs, diagram. (T1, Ge, Si)

37-T. (French.) **Sets of Extruded Bars in First and Second Class Installations. IV.** René Rols. *Revue de l' aluminium,* v. 31, no. 215, Nov. 1954, p. 353-365.

Techniques of mounting bus bars and similar conductors. Photographs, tables. 27 ref. (T1, Al)

38-T. Functions of Materials in Bearing Operation. P. P. Love, P. G. Forrester and A. E. Burke. *Institution of Mechanical Engineers, Automobile Division, Proceedings,* no. 2, 1953-1954, p. 29-39 + 4 plates; disc., p. 40-44.

Bearing design, factors affecting operation, selection of metals. Diagrams, photographs, micrographs, graphs. 16 ref. (T7, SG-c)

39-T. Structural Design With Formed Aluminium Sheet. I. Cedric Marsh. *Light Metals,* v. 18, Feb. 1955, p. 57-59.

Alloys available, economics of folded sections, design formulas. Table, graphs, diagrams. (To be continued.) (T26, Al)

40-T. Try Gray Irons. John L. Everhart. *Materials & Methods,* v. 41, Feb. 1955, p. 90-93.

Properties, applications and cost advantages of various gray iron compositions. Photographs, table, graph. (T general, CI)

41-T. Stainless at Work. Edward W. Hopper and E. A. Schoefer. *Steel,* v. 136, Feb. 21, 1955, p. 74-77.

Use of welded overlays to combat corrosion in paper pulping installations and all stainless construction in food processing equipment. Photographs, table. (T29, L24, R general, SS)

42-T. Turbines and Tomorrow's Metals. *Steel,* v. 136, Feb. 28, 1955, p. 88-90.

Demands for higher efficiencies and consequently higher operating temperatures impose difficult metallurgical problems. Photographs, graph. (T25, SG-h)

43-T. (German.) **Aluminum Alloys as Bearing Metals.** E. Vaders. *Aluminium,* v. 31, no. 2, Feb. 1955, p. 55-57.

Requirements of bearing metals, development of new alloy for high-thermal and mechanical stresses. Tables. 4 ref. (T7, Al)

44-T. (German.) **Light Alloy Piston and Its Importance for the Aluminum Industry.** Ernst Mahle. *Aluminium,* v. 31, no. 2, Feb. 1955, p. 70-74.

Around 100,000 tons per year are used for piston production. Advances due to alloy developments. Photographs, table, micrographs, graph. 3 ref. (T7, Al)

45-T. Aluminium in the Oil Industry. H. M. Bigford. *Metallurgia,* v. 51, no. 304, Feb. 1955, p. 75-80.

High-thermal conductivity, lightness and durability favor use of aluminum alloys in pipe lines and tanks. Welding characteristics, mechanical properties and corrosion resistance. Tables, photographs, diagram. (T28, K general, M general, R general, Al)

46-T. Aluminium in Electrical Engineering. J. C. Bailey. *Metallurgia,* v. 51, no. 304, Feb. 1955, p. 81-91.

Economic and technical advantages of use as cable conductors, sheathing, bus-bars and windings. Tables, graph, photographs, diagram. 22 ref. (T1, Al)

47-T. (Book.) **Kaiser Aluminum Electrical Conductor Technical Manual.** 192 p. 1954. Kaiser Aluminum & Chemical Sales, Inc., 919 North Michigan Boulevard, Chicago 11, Ill.

Reference book to meet the needs of users of aluminum as an electrical conductor material; physical and mechanical properties. (T1, P general, Q general, Al)

V

Materials

General Coverage of Specific Materials

59-V. Aluminum 2024. Heat Treatable Wrought Aluminum Alloy. *Alloy Digest,* no. Al-23, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance and general characteristics. (Al)

60-V. Ampco Metal—8. Aluminum Bronze. *Alloy Digest,* no. Cu-23, Feb. 1955.

Composition, physical and mechanical properties, machinability, workability, weldability, corrosion resistance and general characteristics. (Cu, Al)

61-V. Dowmetal G. Heat Treatable Magnesium Casting Alloy. *Alloy Digest,* no. Mg-15, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, weldability, corrosion resistance and general characteristics. (Mg, Al)

62-V. "S" Monel. Nickel Casting Alloy. *Alloy Digest,* no. Ni-16, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, welding, machinability, corrosion resistance and general characteristics. (Ni, Cu)

63-V. Carpenter No. 5-317. Nickel-Chromium Steel. *Alloy Digest,* no. SA-27, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, weldability and general characteristics. (AY)

64-V. Enduro HC. Heat and Corrosion Resisting Steel. *Alloy Digest,* no. SS-25, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance and general characteristics. (SS)

65-V. Jessop G.18B. Heat Resisting Alloy. *Alloy Digest,* no. SS-26, Feb. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, weldability, corrosion resistance and general characteristics. (SS)

66-V. Vasco Supreme A. High Speed Steels. *Alloy Digest,* no. TS-30, Feb. 1955.

Composition, mechanical properties, heat treatment, machinability, workability and general characteristics. (TS)

67-V. Vanadium. A. F. G. Cadenhead. *Canadian Metals,* v. 18, Feb. 1955, p. 22, 24.

Occurrence, production, properties. (V)

68-V. A Forgeable High-Temperature Chromium-Iron Alloy. (Digest of "The Development of a Forgeable High-Strength, High-Temperature, Chromium-Rich, Chromium-Iron Alloy," by D. P. Moon, H. A. Blank and A. M. Hall; WADC Technical Report 53-451, Jan, 1954.) *Metal Progress,* v. 67, Feb. 1955, p. 138, 140, 142.

Composition, properties and working characteristics of alloy containing not over 2% of critical metals. (SG-h, Fe, Cr)

69-V. Copper and Copper Alloys. A Survey of Technical Progress During 1954. E. Voce. *Metallurgia,* v. 51, no. 303, Jan. 1955, p. 9-16.

Developments in raw materials, extraction, fabrication, finishing and properties. 167 ref. (Cu)

70-V. Recent Progress in Alloy and Special Steels. G. T. Harris and E. Johnson. *Metallurgia,* v. 51, no. 303, Jan. 1955, p. 17-23.

Developments in alloy and special steels. Tables, photographs. 36 ref. (AY, ST)

71-V. Carbon—a Neglected Metallurgical Tool? Carl E. Swartz. *Metal Progress,* v. 67, Feb. 1955, p. 77-81.

As a material of construction, carbon has long been neglected. Few metallurgists realize its possible applications in their work, and fewer still have had any experience with it. Nevertheless, in the foundry, in the steel mill, in nuclear reactor technology and in various other metallurgical operations, it has many properties which make it a useful and economical material. Photographs. (C)

72-V. Water Hardening Tool Steels. George A. Roberts. *Tool Engineer,* v. 34. Feb. 1955, p. 87-90.

Reasons for large number of grades of plain carbon of carbon-vanadium steels. Photographs, tables. (ST)

73-V. Thermenol—A Non-Strategic Aluminum-Iron Base Alloy for High Temperature Service. U. S. Naval Ordnance Laboratory. *U. S. Department of Commerce, Office of Technical Services,* PB111530, 1954, 18 p. $0.50.

New alloy with 16% aluminum and 3% molybdenum resists oxidation at temperatures up to 2300° F., is 20% lighter than stainless steel, and has good stress-rupture life. Photographs, tables. (R2, Q4, SG-h, Fe, Al, Mo)

74-V. (Dutch.) **Copper and Copper Alloys. XIV. Special Brass.** W. G. R. de Jager. *Metalen,* v. 10, no. 1, Jan. 15, 1955, p. 8-10.

Composition, structure, and physical properties. Tables. (Cu)

75-V. (Russian.) **Strength of Nodular Graphite Cast Iron.** I. V. Kudriavtsev and N. B. Baranova. *Liteinoe Proizvodstvo,* 1954, no. 9, Dec., p. 6-10.

Composition, mechanical properties and conditions of heat treatment. Tables, graphs. (CI)

76-V. BA.46. Aluminum Casting Alloy. *Alloy Digest,* no. Al-24, Mar. 1955.

Composition, physical constants, mechanical properties, heat treatment, machinability, weldability, corrosion resistance and general characteristics. (Al)

77-V. Herculoy 420. Silicon Bronze. *Alloy Digest,* no. Cu-24, Mar. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance, pickling and general characteristics. (Cu, Si)

78-V. Rodar. A Metal-to-Glass Sealing Alloy. *Alloy Digest,* no. Fe-6, Mar. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, pickling and general characteristics. (K11, Fe, Ni, Co)

79-V. Electron ZW1. Magnesium Wrought Alloy. *Alloy Digest,* no. Mg-16, Mar. 1955.

Composition, physical and mechanical properties, machinability, workability, weldability, corrosion resistance, surface treatment and general characteristics. (Mg)

80-V. "K" Monel. Corrosion Resistant Nickel-Base Alloy. *Alloy Digest,* no. Ni-17, Mar. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance and general characteristics. (Ni)

81-V. Sicromo 7. High Temperature, Corrosion Resistant Alloy Steel. *Alloy Digest,* no. SA-28, Mar. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance and general characteristics. (SG-g, h, AY)

82-V. Cyclops 17B. Corrosion & Heat Resisting Alloy Steel. *Alloy Digest,* no. SS-27, Mar. 1955.

Composition, physical and mechanical properties, heat treatment, machinability, workability, weldability, corrosion and heat resistance and general characteristics. (SS)

83-V. Ultimo-6. Hot Work Tool Steel. *Alloy Digest,* no. TS-31, Mar. 1955.

Composition, mechanical properties, heat treatment, machinability, workability, weldability and general characteristics. (TS)

84-V. Nak. a Versatile Alloy. *Chemical and Engineering News,* v. 33, Feb. 14, 1955, p. 648, 650.

Preparation, reactions and technology of this unique alloy. Flowsheet, table, phase diagram. (Na, K)

85-V. Where Is Titanium Headed? *Chemical Week,* v. 76, Feb. 19, 1955, p. 34 + 11 pages.

Reviews market, applications and technology. Graph, flowsheet. (A general, Ti)

86-V. Nodular Cast Iron—Its Present Position and Future Prospects as an Engineering Material, With Special Reference to Its Suitability for Crankshafts. S. B. Bailey. *Institution of Mechanical Engineers, Proceedings,* v. 168, no. 24, 1954, p. 643-657 + 12 plates; disc., p. 657-678.

Review of production, properties and applications. Diagrams, photographs, micrographs, graphs, tables. 43 ref. (T7, CI)

87-V. Titanium—Its Progress and Applications. T. E. Perry and R. J. Garmy. *Iron and Steel Engineer,* v. 32, Feb. 1955, p. 98-105; disc., p. 105-106.

Review of titanium metallurgy. Applications in jet engines. (T25, Ti)

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AIRCRAFT
Division of United Aircraft Corporation
East Hartford 8, Connecticut

88-V. General Physical Metallurgy of Titanium Reviewed. Robert I. Jaffee. *Journal of Metals,* v. 7, Feb. 1955, p. 247-252.

Review of alloying effects and possibilities, structures and improvements in mechanical properties. Graphs, tables, micrograph. 7 ref. (Ti)

89-V. Titanium Alloy Extrusions Now Available. G. A. Moudry. *Materials & Methods,* v. 41, Feb. 1955, p. 86-87.

Advantages of extrusions over rolled shapes, properties. Photographs. (Ti)

90-V. Looking Ahead in Uranium. W. B. Hall. *Mines Magazine,* v. 45, Jan. 1955, p. 16, 36, 46.

Possibilities of future growth in the uranium industry. (U)

91-V. Heat Resistant Cast High Alloys. C. K. Lockwood. *Product Engineering,* v. 26, Feb. 1955, p. 163-167.

Properties and applications of ACI class I (18 to 30% chromium), class II (18 to 32% chromium, 8 to 22% nickel), and class III (33 to 68% nickel, 10 to 21% chromium) alloys. Tables, graphs, photographs. (SS, SG-h)

92-V. The Corrosion-Resisting High-Silicon Iron Alloys. J. Dodd. *Corrosion Technology,* v. 2, Feb. 1955, p. 37-42.

Production, properties, structure, application. Tables, micrographs, graph, photograph. (Si, Fe)

93-V. Super Purity Aluminium. Production, Properties and Applications. E. E. Spillett. *Metallurgia,* v. 51, no. 304, Feb. 1955, p. 59-64.

Double electrolytic process, corrosion resistance, mechanical and physical properties, applications. Diagram, tables, photographs, graph. 3 ref. (Al)

94-V. Aluminium and Its Alloys in 1954. Some Aspects of Research and Technical Progress Reported. E. Elliott. *Metallurgia,* v. 51, no. 304, Feb. 1955, p. 65-74.

Review of published data. 125 ref. (Al)

95-V. Zinc and Its Uses: 1952-54. *Metallurgia,* v. 51, no. 304, Feb. 1955, p. 93-99.

Production and consumption of metal, alloys and zinc oxide. Tables, photographs. 31 ref. (Zn)

96-V. (Pamphlet.) **Facts About Manganese.** 22 p. 1953. Bureau of Mines, U. S. Department of the Interior, Washington, D. C.

Uses, history, sources, production processes, future supply prospects. (Mn)

97-V. (Pamphlet.) **Thermenol. A Non-Strategic Aluminum-Iron Base Alloy for High-Temperature Service.** J. F. Nachman and W. J. Buehler. PB 111530, June 1954, 14 p. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.50.

Production techniques; control of grain structure; effects of impurities; mechanical and physical properties. Tables, photographs, diagrams. (Fe, Al, SG-h)

ENGINEER FOR TITANIUM RESEARCH

Engineering job with a future. Development work in titanium fabrication and allied research. Writing of manufacturing specifications. Some contacts with prospective titanium metal users. College graduate in Metallurgy, Metallurgical Engineering or allied field preferred. Experience in steel production, heat treating and working knowledge of titanium desirable. Should possess initiative and have growth potential for future managerial position. Well-established Michigan manufacturer in non-ferrous field. Preferred age, under 35. Salary commensurate with job requirements and applicants qualifications. State qualifications fully.

Box 4-15, Metals Review

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M. 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

ASSISTANT PROFESSORSHIP IN METALLURGY: Well-known technical college has opening for recent graduate with Ph.D. or Sc.D. in physical metallurgy or metals physics, on their permanent teaching staff. Opportunities to participate in research exist, and staff members are encouraged to enter into other activities which will promote professional growth. In reply, give details of education, experience, age and references. Box 4-20.

RESEARCH OPPORTUNITIES: At university in New York area for Ph.D. metallurgists and for recent graduates desiring graduate work leading to M.S. or D.Sc. in metallurgy. Ph.D. metallurgists have opportunity to do fundamental research in thermodynamics, crystal mechanics, general physical metallurgy and solid state technology with a distinct future possibility for entering research field of own choice. Full-time research assistantships at $250/375 per month plus tuition. Research associateships for qualified Ph.D. at salaries commensurate with experience. Box 4-25.

GRADUATE ASSISTANTSHIP: Ten-month appointment at university in New York area for men interested in pursuing graduate work. Tuition remission plus stipend for ten months and possibility for part-time summer employment in research laboratory. Available Sept. 1, 1955. Box 4-30.

METALLURGIST: With aptitude for research and development in field of high-alloy steels. Prefer man with laboratory experience, possessing sound background in physical metallurgy, capable of organizing research projects and writing clear, concise reports. Opportunities for professional development and advancement. In reply, indicate training, experience, military status and salary requirements. Box 4-35.

METALLURGIST: Development, consulting and trouble shooting on metallurgical problems associated with manufacture of airborne military electronic equipment. Experience in light metals desirable. Salary commensurate with experience and ability. Write: Westinghouse—Air Arm Division—Baltimore 3, Md.

METALLURGIST: Challenging position for ambitious recent college graduate in research laboratory of national investment casting manufacturing company, New York City plant. Company offers good starting salary plus profit-sharing participation, many benefits, plus stimulating engineering associates. Submit full resume. Box 4-40.

METALLURGICAL and MECHANICAL ENGINEER: Work involves all experimental fabrication operations for metallic fuel elements of interest to A.E.C., such as rolling, swaging, forging, extruding, etc. Specific familiarity with these operations is not necessary, although an interest in mechanical and metallurgical factors is required. All problems are attacked both theoretically and practically. The experience required is flexible, ranging from a recent college graduate to a man with several years experience in metalworking or related fields. Original thinking and ability to carry several experimental projects with little supervision as well as ability to work under considerable pressure with frequent changes in program are important. Box 4-45.

ASSISTANT PROFESSOR: Of metallurgical engineering, desired for Sept. 1955, with emphasis on heat transfer, thermodynamics and physical chemistry. Advanced degree essential, experience desirable. Box 4-230.

South

PROCESS METALLURGIST: To assume responsibility for the annealing and heat treatment of ferrous and nonferrous metals. These metals would be tough pitch copper and grain oriented silicon irons. Job to cover the responsibility of factory operations and the setting up of necessary development work to improve factory operations. Job includes work in metallographic aspects of above materials. Box 4-100.

METALLURGICAL ENGINEER: B. S. degree plus 1 to 3 years experience, for research and process development in special alloys having atomic energy application. Location in Ohio. Send complete description of work experience, present salary, etc. Box 4-50.

METALLURGICAL ENGINEER: B.S. degree plus 1 to 3 years experience with interest in welding application and development of welding materials and processes in special alloys including titanium, zirconium, etc. Location Ohio. Please include complete description of work experience, present salary, etc., in reply. Box 4-55.

METALLURGISTS: In the following areas in Industrial Atomic Power: To investigate various materials for nuclear reactors, evaluate corrosion and radiation problems and to study contamination of fluid systems. Box 4-60.

METALLURGIST: Steel fabricating plant located in Indianapolis, Ind., has opening for metallurgical engineering graduate with ferrous metallurgist experience and training for work in material and product control laboratory. Permanent position with good opportunity for qualified person who has initiative and can accept responsibility. In reply, give details as to age, marital status, education, experience and approximate salary expected. Box 4-65.

TOOLSTEEL SALESMAN: For Chicago area. Straight salary. State experience and full information. Box 4-70.

METALLURGICAL DEVELOPMENT: Industrial research opportunity for metallurgist with graduate training and a minimum of ten years contact with metals production and/or fabrication. Should have better-than-average industrial insight coupled with ability to effectively present ideas to industry leaders. Should be capable of assuming technical supervisory activity. Box 4-75.

WELDING RESEARCH: Opening for young engineer interested in rapid professional growth in metallurgy of welding. Expanding program requires high-quality metallurgical training and interest in pursuing programs covering broad fields related to welding. Liberal benefits including tuition-free graduate study. Write: T. E. DePinto, Armour Research Foundation of Illinois Institute of Technology, 10 West 35th St., Chicago 16, Ill.

RESEARCH METALLURGIST: A progressive group engaged chiefly in powder metallurgy needs additional staff. This position offers recent graduate opportunity for close association with senior researchers, ideal convenience for tuition-paid graduate work, and interesting work including aircraft component developments. Salary commensurate with background. Write: T. E. DePinto, Armour Research Foundation of Illinois Institute of Technology, 10 West 35th St., Chicago 16, Ill.

TEACHING FELLOWSHIPS: In metallurgy, available in department of metallurgy in midwestern university, starting September 1955. Opportunity to obtain M.S. and Ph.D. degrees. Box 4-80.

FOUNDRY SUPERINTENDENT: Major manufacturer is seeking top foundry man with precision casting experience for position of responsibility in research activity. Need not possess degree but should have sound experience in this field. Very attractive opportunity with excellent growth potential. Box 4-85.

RESEARCH METALLURGIST: Metallurgical engineers with M.S. or B.S. degrees for positions of responsibility in research department of major automobile manufacturer. At least two years experience desirable. Box 4-90.

RESEARCH ASSISTANTSHIP: Starting Sept. 1, 1955 at $125 per month. Holder takes full course in graduate school, using research on transformation of beta phases in Cu-base alloys as master's thesis. Applicants must hold B.S. in metallurgical engineering. Address: Prof. E. R. Shorey, Chairman, Dept. of Mining and Metallurgical Engineering, University of Wisconsin, Madison 6, Wis.

METALLURGICAL ENGINEER: Recent graduate with interest in research and development work with leading manufacturer of alloy iron rolls. Foundry located in Ohio. Excellent opportunity for advancement. Applicants should be draft exempt. Replies should include details of education, age, experience, references and salary requested. Box 4-95.

West

METALLURGIST: B.S. degree in metallurgical engineering with a year or more experience in mill production or observation work. To work in Los Angeles in metallurgical department for metals distributor doing sales and customer contact work. Reply giving all information, photo and salary required. Box 4-105.

METALLURGISTS

looking for opportunities in the field of

ATOMIC ENERGY

METALLOGRAPHERS	**B.S. plus 2 or more years experience in nonferrous metallography**
METALLURGISTS **SOLID STATE PHYSICISTS** **PHYSICAL CHEMISTS**	**B.S.—M.S.—Ph.D. Fundamental and applied work in corrosion, physical metallurgy, high-temperature problems**
METALLURGICAL or WELDING ENGINEERS	**B.S.—M.S. Applied work in weldability studies, welding methods, etc.**
TECHNICAL EDITORS	**Minimum B.S. degree in science or engineering plus 2—5 years editorial or writing experience**

Send resume' and salary requirements to

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Technical Personnel

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PHYSICISTS

Unusual opportunities for initiative and imagination in research on solid state physics in fields of magnetics, semiconductors, and dielectrics.

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Pioneering research in powdered metals, ceramets, alloys, and pure metals.

Act at once. Write today to Employment Manager, Department B, describing your education and experience.

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FERRITE ENGINEER

Midwest company seeks a chemical, metallurgical or ceramic engineer with a year's experience with ferrite permanent magnets and ferrite cores. Require a person able to do research and development work leading to production (no production supervision involved). Excellent opportunity is afforded to advance with a new product line. Salary is open for discussion. Please send a data sheet outlining education and employment history to:

Box 4-235, Metals Review

METALLURGISTS

Required in *industrial* atomic power. To evaluate materials and corrosion problems and radiation effects on metals for industrial atomic power plants. Send resume to:

Westinghouse Electric Corp.
Industrial Atomic Power
Box 355
Pittsburgh 30, Pa.

POSITIONS WANTED

AIRCRAFT METALLURGIST: Advanced degree, experienced in fabrication and failure analysis of aircraft structures. Desires supervisory position requiring extensive metallurgical background. Box 4-110.

METALLURGIST: With 12 years experience in metallurgical problems related to jet aircraft production and development. Good knowledge of laboratory operation and equipment required for evaluation of development and production type materials. Planned, supervised metallurgical and chemical laboratory for aircraft industry. Desires challenging position in production or development metallurgy, any location. Box 4-115.

PHYSICAL METALLURGIST: Ph.D. degree, age 31, married, children. Broad background and 11 years industrial and research experience in ferrous and nonferrous physical metallurgy. Four years in production metallurgical control in plant manufacturing variety of finished items. Three years brass research, four years research on light metals, especially aluminum. Desires responsible position in research or development in progressive company, preferably in light metal fabrication. Box 4-120.

METALLURGIST: Professional engineer with background of 20 years diversified experience in ferrous metallurgy, particularly in fields of nondestructive testing, ordnance engineering and investigational work. Same sales experience. Desires position in material engineering, development work or associated field. Willing to do part-time traveling. Box 4-125.

METALLURGICAL ENGINEER: B.A., M.S. degree, age 30, veteran, married, one child. Five years experience in metallurgy including gas and steam turbine alloys laboratory. Aircraft process and materials engineering laboratory, development, failure analysis background. Two years as mill metallurgist trouble-shooting in nonferrous specialty mill producing rod, wire, sheet and strip. Experimental work in semicontinuous casting and extrusion. Desires responsible position, preferably in east. Box 4-130.

PHYSICAL METALLURGIST: B.S., M.S. and Ph.D. degrees, age 31, married, children. About three years experience in corrosion and alloy development, and as university teacher. Seeks responsible East Coast or Midwest position in research and development. Box 4-135.

METALLURGIST—SALES ENGINEER: B.S. in metallurgy, nine years experience in sales and technical service of stainless, alloy and toolsteel mill products, two years as control metallurgist in steel mill. Age 37, married, children. Desires sales or technical service. Will send resume on request. Box 4-140.

PHYSICAL METALLURGIST: Ph.D. degree, age 34, married, specialty is welding. Desires research or research and development position closely linked with production. Experience includes seven years research in weldability of steels and general physical metallurgy, five years teaching and consulting. Available in June. Box 4-145.

METALLURGIST: M.S.E. degree. Five years experience, age 29, family. Wide theoretical background. Industrial experience with cast irons, heat treating, specification of materials, investment casting process. Vacuum and air melted alloy development experience. In reply, please describe position as completely as possible. Prefers medium-sized company. Box 4-150.

METALLURGICAL CONSULTANT: Experienced in failure investigations, stress analysis and corrosion. References and records of previous consulting work available. Has own laboratory and field equipment. Desires position with midwestern company on part-time, hourly or retainer basis. Box 4-155.

METALLURGICAL ENGINEER: B.S. degree, family. Thirteen years diversified experience in practically all phases of aluminum fabrication, including melting, rolling, forging, extruding, heat treating and aircraft forming, plus customer contact service, trouble shooting and competent technical reports. Desires position as production quality control metallurgical or technical service. Box 4-160.

METALLURGICAL ENGINEER: B. Met. Eng. and B.S. in chemistry, age 30, married. Three years diversified experience in production and research, including pilot plant operations, production trouble shooting and quality control, research on new methods and processes. Especially suited for development work. Willing to relocate. Box 4-165.

PROCESS METALLURGIST: B.S. in chemistry, age 37, married, one child. Fifteen years experience in process control of electric, O.H. and bessemer steelmaking, including pyrometry, heat treatment, laboratory supervision, reports, inquiries, customer contact and production control. Desires to relocate with stainless, high alloy, tool or other specialty producer. Box 4-170.

METALLURGICAL ENGINEER: B.S. and M.S. degrees plus 42 extra graduate credits. Eleven years ferrous and nonferrous research and development experience including some production work. Has had articles published. Presently located on East Coast, desires position in California. Age 31, married, one child. Box 4-175.

METALLURGICAL CHEMIST: With 15 years experience utilizing every grade and kind of nonferrous scrap to produce bronzes, brasses, babbitts, solders, type metals, aluminum and zinc alloys, etc. to specifications. Extensive work in follow-up of foundry, shop problems. Available in consulting capacity or will do chemical analyses quickly, economically. Box 4-180.

METALLURGIST: B.S. degree, age 26, veteran. Three years experience in research and development, welding metallurgy, ferrous and nonferrous metallography and heat treatment, environmental testing of mechanical and electrochemical properties of ferrous and copper alloys. Desires position in development or possibly production. Cleveland area preferred. Box 4-185.

LIBRARIAN: Woman with long experience organizing patent and research records and report files in metallurgical and engineering laboratories. Literature searches. Library organization and management. Interested in new mechanical methods of literature searching. Prefers Southwest or Midwest. Member A.S.M., Special Libraries Association, American Documentation Institute. Box 4-190.

METALLURGIST: B.S. degree, age 24, married, child. On active duty U.S.N. as assistant

METALLURGISTS

Alloy Development—Composition development for high-temperature and magnetic alloys, phase diagrams, creep, precipitation hardening, vacuum melting and other techniques. Development experience in powder metallurgy, physical metallurgy or alloy systems, background in theoretical physical metallurgy and knowledge of solid state physics useful; M.S. or Ph.D. degree in metallurgical engineering desirable but not required.

Metals Application—Guidance of design and manufacturing engineers in the selection and processing of ferrous and nonferrous metals.

Metallography—Experienced metallurgist to evaluate structures of ferrous and nonferrous commercial and experimental alloys.

Pilot Plant—Follow process, development of casting, working and heat treatment of specialized high-temperature and magnetic alloys.

Send complete resume including salary expectations to:

S. A. Rosecrans
Materials Engineering Dept.
Westinghouse Electric Corp.
East Pittsburgh, Pa.

THE DOW CHEMICAL COMPANY

Rocky Flats Plant
P. O. Box 2131
Denver, Colorado

Metallurgist—**B.S. plus eight to ten years experience in production fabrication, rolling mill, die extrusion and machine shop techniques.**

Physical Metallurgist—**M.S. or higher with three to five years experience in physical metallurgy procedures and development laboratory techniques.**

Classified work on Atomic Energy Commission project. Write giving training and experience to the Personnel Director, The Dow Chemical Company, Rocky Flats Plant, Post Office Box 2131, Denver, Colorado.

logistics plans officer, staff, commander-in-chief, Atlantic Fleet. Experience in personnel supervision, liaison work and report writing. Desires employment with large company offering opportunity for responsible and diversified positions, higher education and promotion. Prefers East or Midwest. Available June. Box 4-195.

METAL JOINING ENGINEER-SUPERVISORY: Fifteen years experience. Fully responsible for all metal joining development, standardization, instruction on tubes, lamps, high-temperature metals for major multiplant electrical manufacturer. Proven record, many national society papers, M.S. degree plus additional graduate work in industrial engineering. Top references. Age 35. Relocation sought with new challenges, incentives, management advancement opportunities. Box 4-200.

TECHNICAL DIRECTOR/ASSISTANT: Desires position with large or small firm. Ph.D. in metallurgical engineering, B.S. in chemistry. Age 35, family. Four years in large fabricating plant, ten years in leading industrial research firm in corrosion and finishing field. Publications. Resume on request. Box 4-205.

PHYSICAL METALLURGIST: B.S. in metallurgy, age 28, married, children. Experience includes 3½ years in foundry, heat treating and welding. Three years in ordnance research and development work. Presently employed, desires position in any of above fields. Prefers New England or Midwest location. Box 4-210.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering expected June from well-known technical college. Age 21. Desires summer position with progressive company. Intends to resume studies as graduate student under scholarship at Eastern university with hopes of returning to same company. Box 4-215.

METALLURGICAL ENGINEER: B.S. degree, plus 10 years experience in aircraft and petro-chemical industry. Age 35. Desires technical sales or liaison position. Wide knowledge super and corrosion resistant alloys in cast and wrought forms. Thorough background in research, production and technical sales. Extensive contacts in industry, Midwest and East. Box 4-220.

GRADUATE METALLURGICAL ENGINEER: Seeks position in sales or sales development. Ten years experience in metals field covering fabrication, automatic welding, technical sales, etc. Free to travel. Thoroughly grounded in super alloys as well as corrosion resistant alloys. Outstanding letters of reference. Box 4-225.

WANTED

Bausch and Lomb Litrow Spectrograph

Used Bausch and Lomb Large Litrow Spectrograph With Quartz Optics. Also, 120,000-Lb. Capacity Tensile Machine Fitted With High and Low Magnification Stress Strain Recording Equipment. Write:

Box 4-240, Metals Review

METALLURGISTS

Expanding program in the processing of metal used in the AEC program will provide positions in the field of applied nonferrous metallurgy for men qualified for development and production work. Well-rounded background in physical metallurgy is desirable but all levels of experience will be considered. Candidates must be eligible for AEC security clearance.

Replies, which will be held in confidence, should include details concerning previous employment, education, salary requirements, personal background and references.

Uranium Division
Mallinckrodt Chemical Works
65 Destrehen Street
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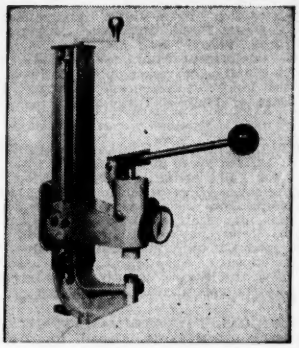

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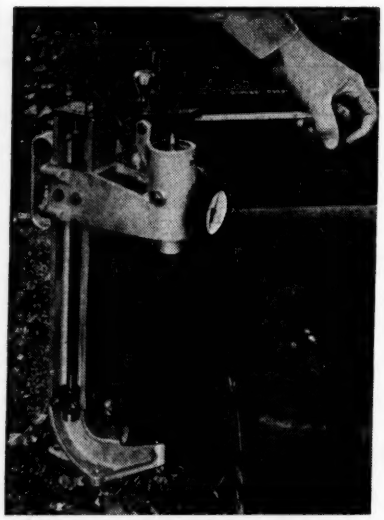

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